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A SYNOPSIS OF AMERICAN EARLY TERTIARY CHEILOSTOME BRYOZOA

BY

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ADVERTISEMENT.

The scientific publications of the United States National Museum consist of two series, the *Proceedings* and the *Bulletins*.

The *Proceedings*, the first volume of which was issued in 1878, are intended primarily as a medium for the publication of original, and usually brief, papers based on the collections of the National Museum, presenting newly acquired facts in zoology, geology, and anthropology, including descriptions of new forms of animals, and revisions of limited groups. One or two volumes are issued annually and distributed to libraries and scientific organizations. A limited number of copies of each paper, in pamphlet form, is distributed to specialists and others interested in the different subjects, as soon as printed. The date of publication is printed on each paper, and these dates are also recorded in the table of contents of the volumes.

The *Bulletins*, the first of which was issued in 1875, consist of a series of separate publications comprising chiefly monographs of large zoological groups and other general systematic treatises (occasionally in several volumes), faunal works, reports of expeditions, and catalogues of type-specimens, special collections, etc. The majority of the volumes are octavos, but a quarto size has been adopted in a few instances in which large plates were regarded as indispensable.

Since 1902 a series of octavo volumes containing papers relating to the botanical collections of the Museum, and known as the *Contributions from the National Herbarium*, has been published as bulletins.

The present work forms No. 96 of the *Bulletin* series.

Richard Rathbun,
Assistant Secretary, Smithsonian Institution,
In charge of the United States National Museum.

Washington, D. C., December 19, 1916.

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PREFACE.

Since 1901 the junior author of this article has devoted much time to the accumulation of Tertiary bryozoa, particular attention being paid to material of this age from American localities. The object of these efforts lay in the hope that sooner or later an opportunity might be offered to monograph the subject. In the meantime the value of the bryozoa for purposes of stratigraphic correlation was recognized and this fact secured the active cooperation of several members of the United States Geological Survey, notably Dr. T. Wayland Vaughan. The collections resulting from these combined efforts proved so large and numerous that it soon became evident one person alone could not complete their study in a reasonable length of time. Besides the intimate relationship of the Tertiary bryozoa with the living forms required a good knowledge of the taxonomy and anatomy of the recent species on the part of the student who attempted the description of the fossil forms. Fortunately for the writer, Ferdinand Canu, of Versailles, France, well known for his extensive and accurate work on Mesozoic, Cenozoic, and Recent bryozoa, very kindly consented, in 1912, to join him in the study of the American Cenozoic faunas, with the result that now, after four years of work interrupted only by exigencies arising from the great war, a monograph of nearly five hundred species of Lower Tertiary Cheilostomata has been completed. As the publication of this monograph will of necessity be slow, it has been thought advisable to precede it with the following brief synopsis of the classification with description of the new genera and their genotypes.

R. S. Bassler.

A SYNOPSIS OF AMERICAN EARLY TERTIARY CHEILOSTOME BRYOZOA.

By Ferdinand Canu,
Of Versailles, France.
AND
Ray S. Bassler,
Of Washington, District of Columbia.

PRINCIPLES OF CLASSIFICATION.

The principles of classification of the cheilostome bryozoa are still imperfect in spite of the quite extended researches of several students. Formerly the classification was based on purely zoarial features, but in the latter half of the nineteenth century the zoœcial characters were more closely studied, especially by D'Orbigny, Smitt, and Hincks. The latter author considered especially the form of the aperture; in other words, only the hydrostatic system. In 1888 and again in 1903 J. Jullien established a systematic set of characters for consideration. These are as follows in diminishing order of importance.

Essential characters.—(1) General morphology (order); (2) form of the frontal wall (suborder); (3) form of the aperture and of the operculum (family); (4) presence of cardelles, occurrence of lyrula and finally ovicells and radicels.

Secondary characters (specific).—Frontal punctations, avicularia, and vibracula.

In 1900 Canu wrote that every family ought to be based on an anatomical peculiarity, common to all its members and fixed in an uninterrupted series of descendance. He established the genera according to the variations of this anatomical peculiarity and according to the divergence in its evolutionary characters. This was a perfection of Jullien's ideas, but the partial application made by Waters to the opercula and the avicularian mandibles did not appear always to lead to uniform results or to the establishment of very natural genera.

We believe that other principles are better. In the bryozoa as in other living beings the form is only the result of a function;

therefore in the study of the morphological variations of the organs we now substitute that of their physiologic functions. Our studies are therefore always directed toward the discovery of functions which modify the skeletal form.

Family.—All the species which have the same larval form have the same lineage and belong necessarily to the same family; therefore the family is characterized by the larval system. The ovicell in which the larva developes is necessarily in rapport with it, and a knowledge of its structure gives the essential characters for readily interpreting the physiological purpose of the morphological and skeletal variations.

Genus.—A really natural genus differs from another genus only in possessing a different function and in the different form of any skeletal part. The essential functions common to all bryozoa without exception are:

1. Passage of eggs and escape of the larvae (=rapport of the operculum and the ovicell).
2. Hydrostatic system and extrusion of the polypide (=form of the aperture and rapport of the operculum with the compensatrix).
3. Calcification and chitinization (=nature of the skeleton and of the frontal considered as immediate deposits of the endocyst).

We have rigorously followed this principle in the establishment of our new genera and we have also modified the diagnoses of the described natural genera which were often incomplete.

The function of the avicularia and of the onychocellaria is not known but it can not be common to all bryozoa because many species are deprived of these structures; these structures therefore can not furnish good generic characters. Nevertheless there are some groups in which their presence appears to be absolutely indispensable to the life of the zoarium and we have therefore considered them sometimes in our generic diagnoses.

The general classification of the Bryozoa showing the larger subdivisions of the Cheilostomata is printed below for convenience of reference.

Class.	*Subclass.*	*Order.*	*Suborder.*	*Division.*
Bryozoa.	Gymnolaemata.	Ctenostomata.		
		Cyclostomata.		
		Trepostomata.		
		Cryptostomata.		
		Cheilostomata	Anasca.	Malacostega.
				Coilostega.
				Pseudostega.
			Ascophora.	
	Phylactolaemata.			

SYSTEMATIC DIAGNOSES.

Order CHEILOSTOMATA Busk.

Suborder ANASCA Levinsen.

A zoœcial hydrostatic system is absent but a zoarial hydrostatic system is present and is included between the cryptocyst and the ectocyst.

The Anasca are classified under the three divisions Malacostega, Coilostega, and Pseudostega.

Division I. MALACOSTEGA Levinsen.

The parietal muscles are attached to the cryptocyst, which is always chitinous. The operculum is a membranous valve. In the fossil forms the frontal wall is quite or partially calcified.

The families of this division represented in the American Eocene are as follows:

Electrinidae D'Orbigny, 1851.
Membraniporae, new group.
Aeteidae Smitt, 1867.
Scrupocellariidae Levinsen, 1909.
Farciminariidae Busk, 1884.
Eucratiidae Hincks, 1880.

Family ELECTRINIDAE D'Orbigny, 1851.

Zoœcia having a chitinous frontal. Intertentacular organ present. Larva a cyphonautes. No avicularia. No dietellae. Operculum with thickened border.

The known genera of the Electrinidae are as follows:

Electra Lamouroux, 1816. Eocene–Recent.
Membranipora Blainville, 1834. Recent.
Heterooecium Hincks, 1892. Recent.
Pyripora D'Orbigny, 1852. Cretaceous–Recent.
Herpetopora Lang, 1914. Cretaceous–Vicksburgian.

The two latter genera have been placed in the family on account of zoœcial resemblance and not from a study of their anatomy. Both of these genera are represented in the Eocene of the United States.

MEMBRANIPORAE, new group.

This very large group is too heterogenous to be considered as a single family; indeed it is certain that the genera classified here at present will ultimately be assigned to many families. Unfortunately we are ignorant of the larvae and researches upon the anatomy of these forms have not been made.

The material upon which our present researches are founded is most abundant; but as it is impossible to establish a satisfactory nomenclature with fossils alone we must be content to utilize the works of our predecessors. We have studied especially the ovicells and their relations to the opercular valve, for these are the organs in closest relation to the larval system. In the following table are listed the genera of *Membraniporae* with the possible family reference of some of them.

SECTION I.—NO OVICELL.

Conopeum Norman, 1903. Cenomanian–Recent.
Membraniporina Levinsen, 1909.
Odontionella, new genus. Lutecian–Recent.
Adenifera, new genus. Jacksonian–Recent.
Trochopora D'Orbigny. Lutecian–Helvetian.
Otionella, new genus. Campanian–Jacksonian.

SECTION II. OVICELL ENDOZOŒCIAL.

Vibracellina, new genus. Claibornian----------------Lunulariidae.
Hincksina Norman, 1903. Jacksonian–Recent–Flustridae (Norman).
Ogivalina, new genus. Jacksonian----------------Onychocellidae.
Membrendoecium, new genus. Eocene–Recent-----Farmicinariidae.

SECTION III. OVICELL HYPERSTOMIAL, CLOSED BY THE OPERCULAR VALVE.

Periporosella, new genus. Jacksonian.
Ellisina Norman, 1913. Senonian–Recent.
Grammella Canu, 1916. Santonian–Recent.
Membraniporidra, new genus. Jacksonian–Vicksburgian.
Tremopora Ortman, 1890. Helvetian–Recent.
Larnacius Norman, 1903. Recent.

SECTION IV. OVICELL HYPERSTOMIAL, NOT CLOSED BY THE OPERCULAR VALVE.

Alderina Norman, 1903. Senonian–Recent.
Callopora Gray, 1848. Santonian–Recent.
Amphiblestrum Gray, 1848. Senonian–Recent.
Ramphonotus Norman, 1894. Senonian–Recent.
Tegella Levinsen, 1909. Santonian–Recent.
Stamenocella, new genus. Senonian–Vicksburgian---Bicellariidae.

SECTION I. MEMBRANIPORAE WITHOUT OVICELL.

Genus CONOPEUM Norman, 1903.

1903. *Conopeum* NORMAN, Natural History of East Finmark, Annals Magazine Natural History (7), vol. 11, p. 586 (1848. Gray, List British Animals British Museum, Centroniae, pp. 108, 146).

No ovicell, no dietellae, no avicularia. The margins of the mural rim are wholly granulated. A distal, multiporous septula; 2 or 3 lateral septulae. Triangular, interopesial hollows having peculiar walls.

Genotype.—Membranipora lacroixii Authors. Range: Cenomanian–Recent.

The American Eocene species are *Conopeum lacroixii* Busk, 1852, from the Clabornian and Lower Jacksonian of Mississippi, *C. hookeri* Haime, occurring in the Lower Jacksonian of Mississippi and seven new species ranging from the Midwayan to the Jacksonian.

Genus MEMBRANIPORINA Levinson, 1909.

1909. *Membraniporina* Levinsen, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 145.

Membranipores exhibiting neither ovicells nor avicularia.

Membraniporina is not a true genus but is simply an artificial grouping proposed by Levinsen for the reception of species incompletely described or of which we have insufficient information to place them more definitely.

The American species of *Membraniporina* are *Membraniporina rimulata* Ulrich, 1901, from the Aquia formation of Maryland, *M. laxa* Reuss, 1869, from the Claibornian of Alabama, and five new species from the Midwayan, Jacksonian, and Vicksburgian of the Southern States. The following new species is interesting because of the peculiar, calcified tubule in the zoœcium.

MEMBRANIPORINA BENJAMINI, new species.

Plate 1, fig. 1.

Description.—The zoarium is incrusting. The zoœcia are large, elongate, elliptical, and distinct; the mural rim is rounded, smooth everywhere of equal width. The opesium is median, elliptical, entire. In the vicinity of the septulae there is often an incomplete small canal.

Measurements.[1]—Opesia $\begin{cases} ho=0.57 \text{ mm.} \\ lo=0.30 \text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=0.65\text{–}0.70 \text{ mm.} \\ lz=0.40\text{–}0.45 \text{ mm.} \end{cases}$

Affinities.—Only the fragment figured, which is of considerable interest, has been found. In the proximal part of the zoœcium in front of each septula, there is a sort of incompletely calcified tubule serving probably to protect the mesenchyme filaments which pass from one zoœcium to another.

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[1] In the citation of measurements, *ho* is the length and *lo* the width of the opesia, *Lz* and *lz* similarly the length and width of the zoœcia, *Lv* and *lv* the same for the vibraculum, *Lon* and *lon* for the onychocellaria, *ha* and *la* for the apertura, etc.

This interesting species is named after Dr. Marcus Benjamin, editor of the United States National Museum.

Occurrence.—Upper Jacksonian: Rich Hill, 5¼ miles southeast of Knoxville, Crawford County, Georgia (very rare).

Type.—Cat. No. 62596, U.S.N.M.

ODONTIONELLA, new genus.

(*Odontion*, denticle.)

No intertentacular organ. No dietellae. With denticular plate in the opesia. Septulae fairly numerous. Zoarium may be unilaminate or bilaminate in the same species. (After Waters.)

Genotype.—*Membranipora hians* Hincks, 1885. Range.—Lutecian-Recent.

We have instituted this genus for the *hians* group (No. 13) of Waters which this author thought in 1898 should be removed from *Membranipora.*

Odontionella (*Membranipora*) *savartii* Audouin, 1826, the widely distributed Tertiary and recent form occurs in the Upper Jacksonian and Vicksburgian of Mississippi and Alabama.

ADENIFERA, new genus.

(*Aden*, gland.)

With a distal glandular penthouse.

Genotype.—*Membranipora armata* Haswell, 1880. Range.—Jacksonian-Recent.

ADENIFERA INARMATA, new species.

Plate 1, fig. 2.

Description.—The zoarium is unilamellar, living upon algae; its lower side bears hydrostatic tuberosities. The zoœcia are very large, ogival in form, and distinct; the mural rim is very finely granulated, rounded, enlarged at the base where it sometimes bears callosities. The opesium is entire, elliptical but somewhat irregular. On the distal part of the mural rim there is an arched pad which is hollow, fragile, and symmetrical, the forepart containing two glands. No avicularia.

Measurements.—Opesia $\begin{cases} ho=0.60\text{–}0.66 \text{ mm.} \\ lo=0.50 \text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=0.80\text{–}0.90 \text{ mm.} \\ lz=0.60\text{–}0.70 \text{ mm.} \end{cases}$

Affinities.—This species differs from *Adenifera* (*Membranipora*) *striata* MacGillivary, 1904, from the Miocene of Australia, in its much smaller micrometric measurements and in the reduction of its cryptocyst. It differs from the recent *A. armata* Haswell, 1880, in the total absence of a lateral avicularium on the distal arch.

Occurrence.—Middle Jacksonian: Near Lenuds Ferry, South Carolina (common).
Wilmington, North Carolina (very rare).

Type.—Cat. No. 62570, U.S.N.M.

Genus TROCHOPORA D'Orbigny, 1851.

1851. *Trochopora* D'Orbigny, Paleontologie française, Terrain Cretace, Bryozoaires, vol. 5, p. 506.

The zoarium has the Lunulites form. The zoœcia and the vibracula are arranged in distinct rows. The ancestrular zoœcia are either hydrostatic or radicular. The growth of the zoarium is effected by superimposed (unizoœcial) disks with the zoœcia arranged in single rows. No ovicell. The vibracula are symmetrical.

Genotype.—*Trochopora conica* Defrance, 1883.

Range.—Lutecian–Helvetian.

Trochopora (*Lunulties*) *bouei* Lea, 1833, of the Claibornian and Lower Jacksonian of the Southern States and *Trochopora* (*Lunulites*) *truncata* De Gregorio, 1890, from the same horizons are two abundant species of this genus in America.

OTIONELLA, new genus.

(*Otion*, a little ear, in allusion to the form of the vibraculum.)

The zoarium is discoidal (Lunulites form), with neither ovicell nor radicular and hydrostatic zoœcia. The vibraculum is interzoœcial, unsymmetrical, auriculated, one lip more prominent than the other. The zoœcia are hexagonal and disposed in quincunx on the outer face and in radial lines on the inner side. The ancestrula is as large as the other zoœcia and of the same form.

Genotype.—*Otionella perforata*, new species.

Range.—Campanian–Jacksonian.

Besides the genotype described below, three other new species of the genus are known in the Claibornian and Jacksonian.

OTIONELLA PERFORATA, new species.

Plate 1, figs. 3, 4.

Description.—The zoarium is discoidal with a concave inner face. The zoœcia are ogival in shape, broad, distinct, separated by a furrow, disposed in very irregular radial and transverse lines; the mural rim is broad on the sides and below with a projecting summit; the opesium is elliptical, little elongated, nearly orbicular, bordered by a projecting collar. The vibraculum is as large as the zoœcium, unsymmetrical and auriculated, rather narrow. On the inner face the radial ribs are perforated with numerous pores. There are at least two pairs of large lateral septulæ to each zoœcium and only one pair in the vibraculum.

Measurements.—Opesium $\begin{cases} ho=0.12 \text{ mm.} \\ lo=0.10 \text{ mm.} \end{cases}$

Zoœcium $\begin{cases} Lz=0.25 \text{ mm.} \\ lz=0.20\text{–}0.27 \text{ mm.} \end{cases}$

Vibraculum $\begin{cases} Lv=0.25 \text{ mm.} \\ lv=0.10 \text{ mm.} \end{cases}$

Occurrence.—Claibornian: Claiborne, Alabama (common).
Lower Jacksonian: Jackson, Mississippi (common).

Type.—Cat. No. 62571, U.S.N.M.

SECTION II. MEMBRANIPORAE WITH ENDOZOŒCIAL OVICELL.

We have recognized four genera of Membranipores provided with an endozoœcial ovicell, a structure which distinguishes them from genera of the first section quite as clearly as from those which have a hyperstomial ovicell. Furthermore, these four genera do not appear to belong even to the same family.

Vibracellina may perhaps belong to the Lunulariidae.

Hincksina, according to Norman, is a member of the Flustridae.

Ogivalina is possibly a member of the Onychocellidae.

Membrendoccium may perhaps be referred to the Farciminariidae.

In the present state of bryozoology, generic grouping in distinct families quite frequently is necessarily artificial, arbitrary, and problematic since we lack anatomical and larval data in many cases. It is better therefore to maintain these four genera in the present place rather than to introduce them doubtfully into the recent families mentioned above.

VIBRACELLINA, new genus.

Endozoœcial ovicell. Auriform vibracula. No cryptocyst. No dietellae.

Genotype.—*Vibracellina capillaria*, new species. Claibornian.

VIBRACELLINA CAPILLARIA, new species.

Plate 1, fig. 5.

Description.—The zoarium incrusts small shells. The zoœcia are elongate, distinct, oval, with a very small gymnocyst; the mural rim is convex, salient, very thin, almost capillary. The opesium is oval, entire. The vibraculum is interzoœcial, unsymmetrical; its opesium is oblique and bounded by two lips of which the upper one is convex and sinuous. The ovicell is a distal convexity.

Affinities.—At the center of the figured zoarium may be noted two smaller zoœcia almost equal; which of these is the ancestrula can not be discerned. It is also to be noted that excepting these, the zoœcia assume their normal size almost immediately. The absence of gymnocyst and cryptocyst will distinguish this species easily from *Pyripora confluens* Canu, 1907 (not Reuss).

Occurrence.—Claibornian (Lisbon beds); Moseley's Ferry, Caldwell County, Texas (rare).

Type.—Cat. No. 62572, U.S.N.M.

Genus HINCKSINA Norman, 1903.

1903. *Hincksina* Norman, Natural History of East Finmark, Annals and Magazine Natural History, (7) vol. 11, p. 585.

Zoœcia incrusting, having the entire area membraneous, the margin surmounted by numerous spines. Ovicell small, short, and little raised. Avicularia occupying distinct cells sparingly scattered among the zoœcia, oval, with semicircular mandible. No dietellae. (Norman.)

Genotype.—*Membranipora flustroides* Hincks, 1880.

Range.—Jacksonian–Recent.

The American Early Tertiary species of *Hincksina* may be divided into two sections, a new species of each of which is described below.

SECTION I. AVICULARIA LITTLE DIFFERENTIATED.

HINCKSINA JACKSONICA, new species.

Plate 1, fig. 6.

Description.—The zoarium is free, bilamellar, easily divisible into two layers. The zoœcia are elongated, distinct, elliptical, often with a small gymnocyst; the mural rim is convex, enlarged at the base, finely granulated. The opesium is terminal, elliptical, regular, very finely denticulated. The ovicell is endozoœcial and little apparent; it appears as a small distal convexity. Avicularian zoœcia are very rare.

Measurements.—Opesia $\begin{cases} ho=0.35\text{–}0.45 \text{ mm.} \\ lo=0.20\text{–}0.25 \text{ mm.} \end{cases}$

Zoœcia $\begin{matrix} Lz=0.45\text{–}0.65 \text{ mm.} \\ lz=0.35\text{–}0.40 \text{ mm.} \end{matrix}$

The two lamellae forming the zoarium separate very easily, each preserving its own base.

Variations.—The zoœcial length is quite variable; both long and short zoœcia may occur. The avicularian zoœcia or interzoœcial avicularia are rather rare. They are generally primoserial; their opesium presents a lateral constriction but little accentuated.

This species is distinguished from the other species of *Hincksina* by the absence of visible spines and by its free zoarium. It is rather common at many localities of the Jacksonian, of which it appears to be a characteristic fossil.

Occurrence.—Middle Jacksonian: Rich Hill, 5¼ miles southeast of Knoxville, Crawford County, Georgia (abundant), and many other localities.

Type.—Cat. No. 62573, U.S.N.M.

SECTION II. INTERZŒCIAL AVICULARIA DIFFERENTIATED.

HINCKSINA MEGAVICULARIA, new species.

Plate 1, fig. 7.

Description.—The zoarium incrusts other bryozoa. The zoœcia are large, distinct, elongated, pyriform, and have a gymnocyst; the mural rim is convex, salient, provided with 14 to 20 large hollow spines. The opesium is terminal, elliptical, or somewhat pyriform, entire; the interzoœcial avicularium is large, symmetrical, and has a gymnocyst; its opesium is constricted laterally, probably at the place where the pivot ought to be.

Measurements.—Opesia $\begin{cases} ho=0.30\text{–}0.35\text{mm.} \\ lo=0.25\text{mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=0.60\text{–}0.70\text{mm.} \\ lz=0.40\text{mm.} \end{cases}$

Length of avicularia=0.60–0.65mm.

Affinities.—On account of its large avicularia this species approaches the recent *Hincksina pyrula* Hincks, 1881. It differs, nevertheless, in its larger number of spines; unfortunately we are unable to compare the ovicells.

The specimen figured is very instructive. On a zoœcium can be seen the coalescing of opposite spines giving an aspect like the frontal of *Membraniporella*. In other examples many zoœcia are regenerated; in one case a normal zoœcium succeeds a normal zoœcium and a double row of spines results; in another case an avicularium replaces a zoœcium, but in a totally inverted position.

Occurrence.—Middle Jacksonian (Castle Hayne limestone); Wilmington, North Carolina (very rare).

Type.—Cat. No. 62574, U.S.N.M.

OGIVALINA, new genus.

Endozoœcial ovicell. Granular cryptocyst. No dietellae. No spines.

Genotype.—*Ogivalina eximipora*, new species.

The zoœcia have the usual aspect of those in the family *Onychocellidae*, but the interzoœcial onychocellarium is replaced by an interopesial avicularium.

In addition to the genotype this genus is represented by a new species and a new variety from the Middle Jacksonian of North and South Carolina.

OGIVALINA EXIMIPORA, new species.

Plate 2, fig. 1.

Description.—The zoarium is composed of one or more lamellae and incrusts pebbles or creeps over algae. The zoœcia are large, elongated, ogival, distinct, separated by a threadlike ridge; the mural rim is indistinct, thin, flat, smooth, enlarged at the base into a concave, granular, irregular cryptocyst. The opesium is oval, entire, unsymmetrical in its proximal part. The endozoœcial ovicell is a distal convexity, quite apparent. The avicularium is interopesial, triangular, relatively small, and without pivot.

Measurements.—Opesia $\begin{cases} ho=0.75\text{–}0.80 \text{ mm.} \\ lo=0.55\text{–}0.70 \text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=1.20\text{–}1.25 \text{ mm.} \\ lz=0.80 \text{ mm.} \end{cases}$

Length of avicularium=0.40 mm.

Variations.—The opesium has little regularity of shape on account of the very irregular development of the cryptocyst itself. Although the latter is generally plainly visible, there are, nevertheless, zoœcia which are almost devoid of the cryptocyst. But the most important variation is the unsymmetrical shape of its distal border, a lack of symmetry characteristic of the genus *Onychocella.* We know that this phenomenon is occasioned by the obliquity of the polypide in the zoœcium by reason of the attachment of the retractor muscles in one of the proximal corners of the said zoœcium. This anatomical feature appears to have more importance than the absence of the onychocellarium.

Occurrence.—Middle Jacksonian: Wilmington, North Carolina (rare).

Near Lenuds Ferry, South Carolina (very rare).

Rich Hill, Crawford County, Georgia (very rare).

Type.—Cat. No. 62575, U.S.N.M.

MEMBRENDOECIUM, new genus.

(Abbreviation of Membranipore with endozoœcial ovicell.)

Ovicell endozoœcial. Small simple interopesial avicularia. Dietellae present. No spines.

Genotype.—*Amphiblestrum papillatum* Busk, 1884.

MEMBRENDOECIUM PYRIFORME, new species.

Plate 2, fig. 2.

The zoarium incrusts bryozoa or small shells. The zoœcia are very elongate, oval, distinct, and have a gymnocyst; the mural rim is prominent, smooth, somewhat convex, enlarged on the margins, and much enlarged at the base. The opesium is oval, entire. The ovicell is endozoœcial and is a small, smooth, distal convexity. The avicularia are very small, straight, salient, elliptical, often provided with a gymnocyst. The ancestrula is surrounded by closed zoœcia in which the frontal is perforated by an orbicular pore.

Measurements.—Opesia $\begin{cases} ho=0.20\text{–}0.30 \text{ mm.} \\ lo=0.13\text{–}0.16 \text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=0.40\text{–}0.50 \text{ mm (omitting the gymnocyst).} \\ lz=0.24\text{–}0.30 \text{ mm.} \end{cases}$

Variations and affinities.—The length of the gymnocyst is quite variable even on the same zoarium; therefore in the micrometric measurements it is preferable not to count the gymnocyst for many of the zoœcia are devoid of it. The reduction of the zoœcial length is frequent in this species and affects the entire zoarium; it is rather a rare occurrence when some mechanical obstacle is not opposed to the free development of the zoœcia.

Occurrence.—Vicksburgian: 7½ miles southwest from Bladen Springs, Alabama (very rare).

Middle Jacksonian: Lenuds Ferry, South Carolina (rare).

Lower Jacksonian: Jackson, Mississippi (very rare).

Type.—Cat. No. 62576, U.S.N.M.

SECTION III. OVICELL HYPERSTOMIAL, ALWAYS CLOSED BY THE OPERCULUM.

It is not easy to recognize on a fossil form whether the opercular valve does or does not close the hyperstomial ovicell. After many dissections which we have made on living species we have recognized that ovicells of this kind generally leave a concave cicatrix above the mural rim, a part of which is thus concealed. We would add that the different genera grouped in this section, although very natural in themselves, appear to belong to different families which the zoologists alone can determine.

PERIPOROSELLA, new genus.

(*Peri*, around; *poros*, pores.)

Each zoœcium is surrounded by a special series of dietellae (12–16) communicating with two large septulae.

Genotype.—*Periporosella tantilla*, new species. Jacksonian.

In all the other genera of Membranipores provided with dietellae, the latter occupy only the anterior half of the zoœcium. In the genus *Periporosella* they are, on the contrary, arranged all about the zoœcium, as in the family Adeonidæ. These dietellae are invisible externally, and they become apparent only in tangential sections of some depth.

PERIPOROSELLA TANTILLA, new species.

Plate 2, figs. 3. 4.

The zoarium is free, formed by two lamellae joined together and inseparable. The zoœcia are generally indistinct, very elongated, rectangular; the mural rim is broad, flat, enlarged at the base. The opesium is elliptical, somewhat enlarged distally, and very finely denticulated. The ovicell is deep, but placed above the large distal septula; it projects but little exteriorly. The avicularia are interzoœcial, rare, elliptical, without pivot, but with two lateral denticles; numerous dietellae in each zoœcium.

This type of structure is different from all others on account of its dietellae, its method of gemmation, its ovicell, and even its avicularia. It certainly belongs to a family which our present zoological knowledge will not yet permit us to suspect.

Occurrence.—Middle Jacksonian: Wilmington, North Carolina (common). Near Lenuds Ferry, South Carolina (rare).

Eutaw Springs, South Carolina (rare).

Type.—Cat. No. 62577, U.S.N.M.

Genus ELLISINA Norman, 1903.

1903. *Ellisina* NORMAN, Natural History of East Finmark, Annals and Magazine Natural History (7), vol. 11, p. 596.

The zoœcia are furnished with avicularia, ovoid or triangular, situated on the hinder portion of the zoœcium. The ovicell is well developed, typically with a flattened area on its front. In the type-species the pore-chambers (dietellae) are very large; one distal; the position of the remaining chambers is very unusual, the two front lateral pairs project outside the side walls, which is the reverse of the usual rule.

Genotype.—*Membranipora laxata* Hincks, 1882. (Norman.)
Range.—Senonian–Recent.

ELLISINA LAXA, new species.

Plate 2, fig. 7.

Description.—The zoarium incrusts pebbles and especially shells. The zoœcia are large, distinct, broad, ogival; the mural rim is very thin, little salient, curved, finely striated. The opesium is very large and of the same form as the zoœcium. The avicularium is triangular, interzoœcial, transverse, and without pivot.

Measurements.—Zoœcia $\begin{cases} Lz=0.75\text{–}0.95 \text{ mm.} \\ lz=0.50\text{–}0.75 \text{ mm.} \end{cases}$

Affinities.—The dietellae open into the zoœcia in large pores which are really the remains of multiporous septulae. The ovicell is rare and very small.

The species differs from *Ellisina* (*Semiflustrella*) *rhomboidalis* D'Orbigny in its dimensions twice as large and in the ogival and nonrhomboidal form of the zoœcia. It is the largest known species of *Ellisina.*

Occurrence.—Middle Jacksonian: Wilmington, North Carolina (very rare).

Upper Jacksonian (Ocala limestone): 1½ miles above Bainbridge, Georgia (rare).

Vicksburgian: Salt Mountain, 5 miles south of Jackson, Alabama (very rare).

Type.—Cat. No. 62580, U.S.N.M.

GRAMMELLA Canu, 1916.

1916. *Grammella* CANU, Bulletin Société Géologique de France (4), vol. 16.

The operculum closes the ovicell. The avicularium is interzoœcial, large, with a solid pivot; its form recalls that of the Greek letter θ. No dietellae.

Genotype.—*Membranipora crassimarginata* Hincks, 1880.

Range.—Santonian-Recent.

GRAMMELLA TRANSVERSA, new species.

Plate 2, fig. 6.

Description.—The zoarium incrusts bryozoa. The zoœcia are but little elongated, broad, distinct; the mural rim is thin, sharp edged, regular. The opesium is of the same form as the zoœcium. The ovicell is salient, globular, smooth, and carinated. The avicularium is interzoœcial, small, elliptical, and the pivot is never median; its longitudinal axis is transverse with respect to the zoœcial axis.

Measurements.—Opesia $\begin{cases} ho=0.45 \text{ mm.} \\ lo=0.35\text{–}0.40 \text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=0.55\text{–}0.60 \text{ mm.} \\ lz=0.46\text{–}050 \text{ mm.} \end{cases}$

Affinities.—The avicularium is generally elliptical but it is sometimes triangular. The mural rim exhibits a rare and interesting peculiarity. It is not provided with a side which merges into the zoœcium so that the opesium is bounded by the termen itself of the mural rim. The present form differs from other described species of *Grammella* in its small avicularia transversely oriented.

Occurrence.—Middle Jacksonian: Wilmington, North Carolina (very rare).

Type.—Cat. No. 62579, U.S.N.M.

MEMBRANIPORIDRA, new genus.

The operculum always closes the ovicell. No dietellae. No avicularia. One large distal septula; two pairs of lateral septulae.

Genotype.—Membraniporidra porrecta, new species.

The ovicell is deeply excavated in the distal zoœcium. It is only by dissection that we are able to prove by the continuity of the mural rim, although very thin distally, that the ovicell is indeed hyperstomial. The mural rim is always enlarged at the base and finely granular.

This genus differs from *Alderina* Norman, 1903 not only in the closure of the ovicell by the opercular valve but also in the absence of dietellae.

MEMBRANIPORIDRA PORRECTA, new species.

Plate 2, fig. 5.

The zoarium is free, follicular, formed of two very thin leaves, growing back to back and easily separable. The zoœcia are large, elongate, distinct, oval, with a proximal, convex gymnocyst: the mural rim is very thin, salient, curved. The opesium is large, elliptical, entire. The ovicell is globular, little elevated, ornamented with a frontal callosity; it is deeply embedded. A distal septula and two lateral septulae and two distal impressions are present.

Measurements.—Opesia $\begin{cases} ho=0.75 \text{ mm.} \\ lo=0.30 \text{ mm.} \end{cases}$ Zoœcia $\begin{cases} Lz=0.95 \text{ mm.} \\ lz=0.38 \text{ mm.} \end{cases}$

Occurrence.—Middle Jacksonian: Wilmington, North Carolina (common).

Baldock, Barnwell County, South Carolina (rare).

Type.—Cat. No. 62578, U.S.N.M.

SECTION IV. OVICELL NEVER CLOSED BY OPERCULAR VALVE.

The ovicell is widely open above the operculum and the opesium. In the fossil forms the distal part of the mural rim is visible and not modified; the distal cicatrix left by the broken ovicell on the superior zoœcium is shallow. In the recent species this kind of ovicell is closed by a vesicle which retracts or dilates by means of special muscles to facilitate the departure of the larvae or the entrance of the eggs.

Alderina Norman, 1903, *Callopora* Gray, 1848, *Amphiblestrum* Gray, 1848, *Ramphonotus* Norman, 1894, and *Tegella* Levinsen, 1909, belong to this division of the Membranipores and are well represented in the Early Tertiary strata of North America.

STAMENOCELLA, new genus.

(*Stamen*, in allusion to the form of the zoœcium.)

Ovicell hyperstomial, not closed by the opercular valve. No dietellae. Gymnocyst long and flat, supporting a small, sessile, salient avicularium.

Genotype.—*Stamenocella mediaviculifera*, new species.

Range.—Senonian–Vicksburgian.

The genus which is nearest to this type of structure is *Bactrellaria* Marsson, 1887, in which the zoœcia are identical, but are disposed on a single side of a triserial zoarium. The two genera undoubtedly belong to the same family.

STAMENOCELLA MEDIAVICULIFERA, new species.

Plate 3, fig. 1.

Description.—The zoarium is bilamellar, with the two lamellae back to back and inseparable. The zoœcia are very elongated, narrowed behind, distinct or indistinct; the mural rim is thin, salient, somewhat enlarged and attenuated, rounded, smooth. The opesium is elliptical or oval, entire; the gymnocyst is somewhat convex and nearly as long as the opesium. The avicularium is salient and placed in the middle of the gymnocyst. The ovicell is rarely intact.

Measurements.—Opesia $\left\{\begin{array}{l} ho=0.40 \text{ mm.} \\ lo=0.16 \text{ mm.} \end{array}\right.$

Zoœcia $\left\{\begin{array}{l} Lz=0.80 \text{ mm.} \\ lz=0.20\text{–}0.24 \text{ mm.} \end{array}\right.$

Variations and affinities.—This species apparently lived in agitated waters. Although widely distributed, it is often very rare, and specimens are always more or less worn. In this condition the mural rim is worn away and invisible, the zoœcia indistinct, and the avicularia absent or replaced by a concave cicatrix. We have never found the ovicell intact; it is always more or less broken but its place is clearly visible on the gymnocyst. The avicularium is of the simple type without denticles or pivot.

Occurrence.—Middle Jacksonian: Rich Hill, Crawford County, and other localities in Georgia (very common).

Type.—Cat. No. 62581, U.S.N.M.

Family AETEIDAE Smitt, 1867.

Zoarium composed of creeping branches more or less adherent to the substratum, often growing in free tufts adherent only part of their length. Zoœcia uniserial, arising from each other in a tubular prolongation of greater or less length. Opesium terminal, opercular valve at its summit. (After Robertson.)

Genus AETEA Lamouroux, 1812.

The American Eocene deposits contain two species of this genus which for lack of well-preserved specimens can only be referred to the well-known recent species *Aetea anguina* Linnaeus, 1758 and *A. truncata* Landsborough, 1852.

Family SCRUPOCELLARIIDAE Levinsen, 1909.

The zoœcia have large opesia. A gymnocyst and a cryptocyst more or less developed. The mural rim bears distally one or two pairs of spines and laterally a membraneous scutum. The distal wall, consisting of a horizontal basal and an obliquely ascending frontal part, has usually numerous, small, scattered, uniporous septulae basally, while the distal half of each lateral wall has one multiporous septula. Besides dependent avicularia, found in most species, vibracula may also occur on the basal surface of the zoarium, and these are connected with the zoarium by an independent wall. The ovicells are generally hyperstomial. As a rule, radicular fibers occur, sometimes springing from a septula (or a dietella), sometimes from a separate chamber connected with a vibraculum. The zoaria are always free, much branched, most frequently with uni- or few seried zoœcia, generally consisting of a single layer and in most cases jointed by means of chitinous transverse belts. (After Levinsen, 1909.)

American Tertiary specimens are rare, small, and very fragile, and as a result we have been unable to make any detailed studies of the family. The principal genera of this family are:

Caberea Lamouroux, 1816. Vicksburgian–Recent.
Caberiella Levinsen, 1909. Recent.
Canda Lamouroux, 1816. Recent.
Scrupocellaria Van Beneden, 1844. Lutecian–Recent.
Bugulopsis Verril, 1879. Recent.
Hoplitella Levinsen, 1909. Recent.
Rhabdozoum Hincks, 1882. Recent.
Menipea Lamouroux, 1816. Recent.

The two genera *Caberea* and *Scrupocellaria* alone are represented in the American collections studied. *Canda* and *Scrupocellaria* are very similar. Levinsen distinguishes these genera by their ovicells and Waters by their articulation. As the method of articulation and ovicells are not preserved in the fossil forms studied, we can employ but the single genus, *Scrupocellaria* of which *S. elliptica* Reuss, 1869, *S. gracilis* Reuss, 1869, and nine new species have been recognized in American strata.

Family FARCIMINARIIDAE Busk, 1852.

The zoœcia are furnished with an obliquely ascending distal wall and separated by common, lateral walls which are furnished with a small number (two to four) of uniporous septulae; no true spines. The avicularia dependent, sometimes depressed, sometimes strongly projecting. The ovicells are endozoœcial. The zoaria are dichotomously branched tufts, with slender, prismatic, sometimes jointed segments, on which the zoœcia are arranged in longitudinal rows (generally four to six) around an axis formed by the adjoining separating walls. (After Levinsen, 1909.)

There have as yet been no anatomical researches on the representatives of the family.

The known genera are as follows, the last one alone being represented in our American collections.

Columnaria Levinsen, 1909. Recent.
Farciminaria Busk, 1852. Recent.
Nellia Busk, 1852. Lutecian–Recent.

We have added *Heterocella* Canu 1907, to this family because it is not yet advisable to create a distinct family for it.

Genus HETEROCELLA Canu, 1907.

1907. *Heterocella* Canu, Bryozoaires des terrains tertiares des environs de Paris, Anales de Paleontologie, vol. 2, p. 14.

The zoarium is articulated with each segment formed of four rows of zoœcia. The opesia are always oblique; they are small on the converging zoœcia and large on the diverging ones. On the olocyst at the bottom of the zoœcia there are impressions of various forms.

Genotype.—*Vincularia fragilis* Defrance, 1820.

In Europe this genus has been observed only in the French Lutecian. Its constitution is still problematical, for no existing species is comparable to these fossil forms. Some of the zoœcia described by Canu as regenerated are perhaps radicular. In America one new species from the Vicksburgian of Alabama has been discovered.

Family EUCRATIIDAE Hincks, 1880.

Zoarium forming slender, branching, phytoid tufts. Zoœcia uniserial or in two series placed back to back; expanding from the base upwards, with a terminal or subterminal and usually oblique opesium. Neither avicularian nor vibracular appendages known. Ovicell globose hyperstomial. (Robertson.)

The genera of this family are:

Eucratea Lamouroux, 1812,
Gemellaria Savigny, 1811,
Scruparia Hincks, 1880,
Huxleya Dyster, 1858,
Brettia Dyster, 1858.

Genus GEMELLARIA Savigny, 1811.

1811. *Gemellaria* Savigny, Iconographie des Zoophytes de l'Egypte.

Zoarium erect, branching dichotomously, each branch given off from the sides of the zoœcia close to their upper extremity. Zoœcia joined back to back and each pair arising from the anterior extremity of the preceding pair. Opesia large, sloping slightly upward. Ovicell? (Robertson.)

Genotype.—Gemellaria loricata Linnæus, 1758.

Gemellaria prima Reuss, 1868, has been identified in the Upper Jacksonian of Alabama.

Division II. COILOSTEGA Levinsen, 1909.
(Opesiulae Jullien, 1888).

The parietal muscles are attached to the ectocyst and traverse the chitinous or partially calcified cryptocyst by means of the opesiules. The hydrostatic system is zoarial but each zoœcium in addition is provided with a hypostege with the cryptocyst calcified.

The families of this division represented in the American Early Tertiary are as follows:

- Opesiulidae Jullien, 1888.
    - Subfamily Onychocellidae Jullien, 1881.
    - Subfamily Microporidae Hincks, 1880.
    - Subfamily Lunulariidae Levinsen, 1909.
- Steganoporellidae Levinsen, 1909.
- Thalamoporellidae Levinsen, 1909.

Family OPESIULIDAE Jullien, 1888.

The parietal muscles are attached to the cryptocyst; their place is indicated either by pores or by lateral indentations called opesiules. The ovicell is endozoœcial.

Subfamily ONYCHOCELLIDAE Jullien, 1881.

The ovicell is endozoœcial. The parietal muscles are attached to the ectocyst. The cryptocyst is calcified. The avicularia are interzoœcial and transformed into onychocellaria.

This subfamily includes six genera, all of which are represented by species in America:

Onychocella Jullien, 1881.	Bathonian–Recent.
Rectonychocella, new genus.	Jacksonian–Recent.
Velumella, new genus.	Jacksonian–Recent.
Diplopholeos, new genus.	Jacksonian, Vicksburgian
Floridina Jullien, 1881.	Senonian–Recent.
Smittipora Jullien, 1881.	Senonian–Recent.

RECTONYCHOCELLA, new genus.

The retractor muscles of the polypide are attached in the median axis of the zoœcia. The opesiular indentations are symmetrical. The onychocellaria are straight, and their opesium presents a posterior part, narrow and denticulated; the mandible is composed of two membranes. The zoœcium is closed by an opercular valve. The mural rim is not separated from the cryptocyst.

Genotype.—*Onychocella solida* Nordgaard, 1907.

Range.—Jacksonian–Recent.

VELUMELLA, new genus.

(*Velum*, sail, in allusion to the membranes of the mandibles.)

The retractor muscles of the polypide are attached in the median axis of the zoœcium; the opesiular indentations are symmetrical. The onychocellaria are straight, without distal canal; the rachis of the mandible bears two broad membranes; the opesium of the onychocellarium is elliptical and entirely denticulated. The operculum is a wholly chitinized simple one, not separable from the ectocyst. Multiporous septulae. The mural rim is distinct from the cryptocyst.

Genotype.—*Velumella* (*Onychocella*) *levinseni*, new name.[1]

DIPLOPHOLEOS, new genus.

(*Diploos*, double; *pholeos*, den of an animal.)

The retractor muscles of the polypide are attached in the median axis of the zoœcium. The lateral indentations are symmetrical and almost transformed into true opesiules. The onychocellaria are straight, their opesium is oval, with a denticulated poster; the mandible (onychocellium) is bimembranous. The mural rim is not separated from the cryptocyst. The zoœcium is closed by an operculum attached to the ectocyst. The axis of rotation of the operculum is indicated by two opesial denticles. The zoœcial opesia are dimorphous; one kind is elongated and the other transverse.

Genotype.—*Diplopholeos fusiforme*, new species.

Range.—Jacksonian, Vicksburgian.

DIPLOPHOLEOS FUSIFORME, new species.

Plate 3, fig. 2.

Description.—The zoarium incrusts shells and pebbles. The zoœcia are hexagonal, a little elongated, separated by a narrow furrow or united among themselves by their mural rims; the cryptocyst is deep, concave, shorter than the opesium, finely granular; the polypidian convexity is protruding, wrinkled or granulated, denticulated on its opesial border; the lateral openings are deep, round, almost becoming true opesiules; the opesium is elongate, semilunate, finely crenulated. The ovicell is an inconspicuous distal convexity, sometimes limited by two lines of lateral suture. The onychocellarium is narrow, fusiform, somewhat larger than the zoœcia; the opesium is median, oval, the point below, with a narrow and denticulated posterior; the terminal point projects above the distal zoœcium, but is very fragile; the distal canal through alteration in fossilization fuses nearly always with the cryptocyst of the distal zoœcium. The heteromorphic zoœcia are a little smaller; their cryptocyst is longer than the opesium which then appears nearly transverse. The ancestrula is of the same form as the zoœcium.

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[1] This new name is proposed for the recent species figured as *Onychocella* species by Levinsen in his Morphological and Systematic Studies on the Cheilostomatous Bryozoa, 1909, pl. 22, figs. 3*a*–*d*.

Measurements.—Opesium of zoœcia
$ho=0.20$ mm. (measuring only to the polypidian convexity).
$lo=0.15$ mm. (without the opesiules).

Zoœcium
$Lz=0.40$ mm.
$lz=0.30$ mm.

Opesium of onychocellaria
$hon=0.20$ mm.
$lopn=0.10$ mm.

Onychocellaria
$Lon=0.40–0.45$ mm.
$lon=0.20$ mm.

Occurrence.—Middle Jacksonian: Wilmington, North Carolina (common).

Upper Jacksonian (Ocala limestone): Old Factory, 1½ miles above Bainbridge, Georgia (common).

Vicksburgian: Salt Mountain, 5 miles south of Jackson, Alabama (rare).

Type.—Cat. No. 62582, U.S.N.M.

Subfamily MICROPORIDAE, Hincks, 1880.

The ovicell is endozoœcial. The parietal muscles, attached at the ectocyst, pass through the calcareous cryptocyst, either by the opesiular indentations or by true perforations called opesiules. The semicircular aperture has generally a more or less strongly chitinized (or calcareous) simple operculum, more seldom an opercular valve. Avicularia present.

The genera comprising this subfamily are:

Rosseliana Jullien, 1888.	Eocene–Recent.
Floridinella, new genus.	Vicksburgian.
Gargantua Jullien, 1888.	Miocene–Recent.
Dacryonella, new genus.	Jacksonian.
Aechmella, new genus.	Cenomanian–Miocene.
Micropora Gray, 1848.	Midwayan–Recent.

FLORIDINELLA, new genus.

The ovicell is endozoœcial and separated from the zoœcia by a fold. The polypidian convexity is not prominent. The opesiular indentations are large and rounded. The opesium is constricted by two symmetrical lateral teeth at the level of the opercular articulation.

Genotype.—Floridinella vicksburgica, new species. Vicksburgian.

FLORIDINELLA VICKSBURGICA, new species.

Plate 3, fig. 3.

Description.—The zoarium is unilamellar, hollow, cylindrical, and incrusts the stems or small roots of algæ. The zoœcia are elongated, distinct, separated by a deep furrow; the mural rim is incomplete, rather broad, distinct from the cryptocyst. The cryptocyst is shallow, smooth or finely granular, longer than the opesium. The polypidian convexity is but slightly projecting; the opesiular indentations are large, symmetrically rounded; the opesium is elongated, constricted superiorly by two lateral teeth placed at the level of the operculum.

Measurements.—Opesium $\left\{\begin{array}{l} ho=0.20 \text{ mm.} \\ lo=0.16 \text{ mm.} \end{array}\right.$

Zoœcium $\left\{\begin{array}{l} Lz=0.50 \text{ mm.} \\ lz=0.30\text{–}0.40 \text{ mm.} \end{array}\right.$

Occurrence.—Vicksburgian: One mile north of Monroeville, Alabama and numerous localities in the State (very abundant).

Type.—Cat. No. 62583, U.S.N.M.

DACRYONELLA, new genus.

(*Dacryon*, tear, referring to the form of the avicularia.)

The polypidian convexity protrudes very little and is inconstant. The opesiules are large, round, lateral indentations. The ovicell is endozoœcial. There are no opesial processes (therefore an opercular valve). The opesium is elongated (therefore the parietal muscles are much developed). The avicularia are very small, constant, placed in all the interzoœcial angles, and have the form of small tear drops.

Genotype.—Dacryonella octonaria, new species. Jacksonian.

This is a *Rosseliana* ornamented with avicularia. As in this genus also, the opesiules are inconstant and placed very far from the aperture in consequence of the great development of the parietal muscles.

DACRYONELLA OCTONARIA, new species.

Plate 3, fig. 4.

Description.—The zoarium incrusts small shells or more often creeps over algae; very frequently it consists of many superposed lamellæ. The zoœcia are somewhat elongated, confluent among themselves, vaguely polygonal; the mural rim is broad, especially below, flat, smooth, oblique. The cryptocyst is terminated distally in a small polypidian convexity. The avicularia are straight, small, interopesial, triangular, projecting chiefly at the point.

Measurements.—Opesia of large zoœcia $\left\{\begin{array}{l} ho=0.10 \text{ mm.} \\ lo=0.14 \text{ mm.} \end{array}\right.$

Opesia of small zoœcia $\left\{\begin{array}{l} ho=0.18 \text{ mm.} \\ lo=0.10 \text{ mm.} \end{array}\right.$

Large zoœcia $\left\{\begin{array}{l} Lz=0.40 \text{ mm.} \\ lz=0.30\text{–}0.40 \text{ mm.} \end{array}\right.$

Small zoœcia $\left\{\begin{array}{l} Lz=0.40 \text{ mm.} \\ lz=0.30 \text{ mm.} \end{array}\right.$

Occurrence.—Middle Jacksonian: Wilmington, North Carolina; also at numerous localities in South Carolina and Georgia.
Upper Jacksonian: Georgia, Alabama, Florida, and Mississippi.

Type.—Cat. No. 62584, U.S.N.M.

AECHMELLA, new genus.

(*Aichme*, head of a lance, referring to the form of the avicularia.)

The polypidian convexity is little prominent. The opesiules are round, lateral indentations. The opesium is often contracted by two lateral teeth at the level of the opercular hinge. The ovicell is endozoœcial. The avicularium is interzoœcial, smaller than a zoœcium, losange shaped, with the form of the head of a lance.

Genotype.—*Aechmella filimargo*, new species.

Range.—Cenomanian–Miocene.

AECHMELLA FILIMARGO, new species.

Plate 3, fig. 5.

The zoarium incrusts Orbitoides. The zoœcia are elongated, distinct, separated by a furrow or united by their mural rims; the mural rim is thin, incomplete, convex, distinct from the cryptocyst. The cryptocyst is shallow, oblique towards the opesium, flat, finely granulose; the opesium is transverse, constricted by two lateral teeth at the level of the rotary axis of the operculum. The polypidian convexity projects but little; the opesiular indentations are large, round, and symmetrical. The ovicell is endozoœcial and small. The ancestrula is a small zoœcium, but otherwise identical with the others.

The avicularium is interzoœcial, smaller than the zoœcia, losange-shaped, with a small distal canal and a round opesium.

Measurements.—Opesium $\begin{cases} ho=0.12 \text{ mm.} \\ lo=0.16 \text{ mm. (including the opesiules).} \end{cases}$

Marginal zoœcia $\begin{cases} Lz=0.50 \text{ mm.} \\ lz=0.30 \text{ mm.} \end{cases}$

Very often the proximal border of the opesium is simply undulated and the opesiules are visible only on account of the opesiular teeth. The opesia of the ovicelled zoœcia seem a little larger than the others.

Occurrence.—Upper Jacksonian; West bank of Sepulga River, Escambia County, Alabama (rare).

Type.—Cat. No. 62585, U.S.N.M.

Subfamily LUNULARIIDAE Levinsen, 1909.

Genus LUNULARIA Busk, 1884.

1884. *Lunularia* Busk, Report on Polyzoa collected by *Challenger*, Cheilostomata, vol. 10, pt. 30, p. 208.

The zoarium has the Lunulites form. The avicularia are symmetrical. Exteriorly and interiorly the zoœcia are arranged in radial rows. The cryptocyst is more or less developed. Both radicular and hydrostatic zoœcia are present. The ovicell is endozoœcial.

Genotype.—*Lunulites capulus* Busk, 1884.

Range.—Cenomanian–Recent.

Lunulites Lamarck, 1812, is not a definite generic type, but is merely a zoarial form adopted for certain reasons. This style of growth obtains in many genera of cheilostome bryozoa, e. g. *Otionella* and *Trochopora* in the Anasca Malacostega; *Lunularia* and *Selenaria* in the Anasca Coilostega, and *Stichopora*, *Fedora*, and *Bipora* in the Ascophora.

Thirteen species of *Lunularia* represented in many cases by abundant specimens are known in the Lower Tertiary strata of the United States. Of these only five, *L. reversa* Ulrich, 1901, *L. distans* Lonsdale, 1845, *L. fenestrata* DeGregorio, 1890, *L. vicksburgensis* Conrad, 1847, and *L. contigua* Lonsdale, 1845, are described.

Family ASPIDOSTOMIDAE Canu, 1908.

The zoœcia have a raised margin, often indistinctly or incompletely developed. The two opesiules appear as narrow incisions, which join the zoœcial aperture; the short polypide tube, which is not continued under the cryptocyst cover, is in most cases provided with marginal flanges. Avicularia are always present. Ovicells are hyperstomial.

Rhagasostoma Koschinsky, 1885, and *Euritina* Canu, 1900, are the only two genera of this family represented in the Early Tertiary of North America.

Genus RHAGASOSTOMA Koschinsky, 1885.

1885. *Rhagasostoma* KOSCHINSKY, Ein Beitrag zur Kenntniss der Bryozoen fauna der älterer Tertiarschichten Bayerns, Paleontographica, vol. 32, p. 29.

The ovicell is hyperstomial and opens above the opercular valve; it has no lateral expansions (compressed process). The avicularia are interzoœcial.

Genotype.—*Rhagasostoma hexagonum* Koschinsky, 1885.

Range.—Lutecian–Miocene.

Genus EURITINA Canu, 1900.

1900. *Euritina* CANU, Revision des Bryozoaires du Cretace figurés par D'Orbigny, Bulletin Societe Geologique France (3), vol. 28, p. 411.

Ovicell hyperstomial, never closed by the opercular valve; avicularium interzoœcial; cryptocyst well developed, with three facets separated by two longitudinal grooves; no dietellae.

Genotype.—*Euritina* (*Eschara*) *eurita* D'Orbigny, 1852.

Range.—Turonian–Eocene.

Family STEGANOPORELLIDAE Levinsen, 1909.

The zoœcium is divided into two chambers. The proximal chamber contains the polypide and the ovaries; it is terminated by an ascending tube, the polypide tube, in which the tentacles are lodged when the polypide is retracted. The upper chamber contains the parietal and opercular muscles. The retractor muscles of the polypide are attached in one of the lower angles of the zoœcium which causes the general asymmetry of the zoœcium. No ovicells. No avicularia. Generally two forms of zoœcia, *a* and *B*. The two opesiulae are generally not separated from the aperture of the zoœcium. The operculum, which is sometimes bounded by a chitinous sclerite proximally sometimes continued immediately into the frontal membrane, is as a rule very large and then suspended by strong hinge-teeth.

Genus STEGANOPORELLA Smitt, 1873.

1873. *Steganoporella* SMITT, Floridan Bryozoa, Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 11, No. 4, p. 15.

The whole of the calcified part of the frontal area lying proximally to the aperture is a depressed cryptocyst; the aperture of the zoœcium is surrounded distally and laterally by a projecting margin;

the zoœcia frequently occurring in two forms, *a* and *B*, and provided with a large operculum armed with teeth, which is suspended by strong hinge-teeth; the polypide tube is never continued proximally beneath the cryptocyst cover. (After Levinsen, 1909.)

Genotype.—Steganoporella (*Membranipora*) *magnilabris* Hincks, 1880.

Range.—Lutecian–Recent.

Four well-marked new species have been discovered in the Jacksonian and Vicksburgian of the Southern States.

Family THALAMOPORELLIDAE Levinsen, 1909.

The tubifer zoœcia have calcareous spicula in the shape of compasses and bows. The ovicells are hyperstomial, with two calcareous layers, springing from the whole anter of the apertura; they are closed by a horizontal cup-shaped chitinized operculum which is connected at its base with the operculum of the gonozoœcium. The opesiulae are always completely separated from the apertura. The opercular valve is membranous or chitinized, and more or less completely separated from the ectocyst by a single or double chitinous sclerite. Interzoœcial avicularia occur.

Genus THALAMOPORELLA Hincks, 1887.

1887. *Thalamoporella* Hincks, Critical Notes on the Polyzoa, Annals Magazine Natural History (5), vol. 19, p. 164.

Characters same as for the family.

Genotype.—Thalamoporella (*Flustra*) *rozieri* Savigny-Audouin, 1812-1826.

Range.—Aquitanian–Recent.

A new species occurs at the top of the Vicksburgian in Mississippi.

Division III. PSEUDOSTEGA Levinsen, 1909.

There are no parietal muscles. The hydrostatic system is external; there is a special hypostege on each zoœcium.

The families of this division are:

Membranicellariidae Levinsen, 1909.
Cellariidae Hincks, 1880.
Coscinopleuridae Canu, 1913.

Family CELLARIIDAE Hincks, 1880.

The whole frontal wall of the zoœcia is a cryptocyst and they have a well chitinized, bilaminar, simple operculum with a straight or concave proximal margin. Within the proximal and sometimes also within the distal margin of the aperture is placed a pair of (or sometimes a single broad) supporting teeth. The subopercular area of the avicularia has an unusually strongly developed, sometimes almost complete, cryptocyst. The ovicells are endotoichal. (After Levinsen, 1909.)

Genus CELLARIA Authors.

The zoarium is articulated, with cylindrical segments (internodes). The ovicell is endotoichal and is closed by a peculiar, chitinous operculum moved by special muscles. The operculum is formed of a chitinized inner part, closing the aperture, covered by the exterior ectocyst.

Genotype.—*Cellaria fistulosa* Linnaeus, 1768.

Range.—Jacksonian–Recent.

Several well-marked new species occur in the American Eocene.

Family COSCINOPLEURIDAE Canu, 1913.

The apertura is semilunar, marginated, anterior, never terminal. The ovicell is hyperstomial, embedded in the distal zoœcia, never closed by the operculum. The onychocellaria are straight but typical.

The known genera are:

Coscinopleura Marsson, 1887.
Escharipora D'Orbigny, 1851.
Macropora MacGillivray, 1893.
?*Quadricellaria* D'Orbigny, 1850.

Genus COSCINOPLEURA Marsson, 1887.

1887. *Coscinopleura* Marsson, Die Bryozoen der Schreibkreide der Insel Rügen, Paleontologische Abhandlungen, vol. 4, p. 71.

The margins of the zoarium are bordered by large vibracula. The frontal is deprived of pores and avicularia.

Genotype.—*Coscinopleura* (*Eschara*) *elegans* Hagenow, 1840.

Range.—Cenomanian–Thanetian.

Eschara digitata Morton, 1834, so prolific in the upper Cretaceons (Vincentown marl) of New Jersey and Delaware is a typical species of this genus.

Genus MACROPORA MacGillivray, 1895.

1895. *Macropora* MacGillivray, Monograph Tertiary Polyzoa Victoria, Transactions Royal Society Victoria, vol. 4, p. 54.

In 1909 Levinsen described this genus as follows:

The zoœcia very thick-walled, provided with pores but without spines and without opesiules. The zoœcial aperture is provided with a well-developed vestibular arch. Ovicells and avicularia wanting, but among the zoœcia we find some which have an aperture of a different form and whose distal margin is furnished with three membranous feeler-like filaments. Dietellae.

Genotype.—Macropora centralis MacGillivray, 1895.

Range.—Eocene-Recent. Two new species in the American Eocene.

Genus QUADRICELLARIA D'Orbigny, 1850.

1850. *Quadricellaria* D'Orbigny, Paleontologie francaise, Terrain cretace, Bryozoaires, vol. 5, p. 32.

Zoarium articulated; segments quadrangular; two opposite faces with large zoœcia and the other two with small zoœcia.

Genotype.—Quadricellaria elegans D'Orbigny.

Range.—Turonian–Senonian. Several new species are known in the Early Tertiary of the United States.

Suborder ASCOPHORA Levinsen, 1909.

The zoœcial hydrostatic system is a sack or compensatrix placed under the frontal and in which the sea water is introduced. The parietal muscles are attached to this sack.

THE COSTULAE.

(Family Cribrilinidae Hincks, 1880.)

The zoœcia have their frontal wall formed of flattened ribs ordinarily hollow, radiating from the outer border toward the median line of the zoœcia, where they are intimately joined together; these ribs are united to one another, sometimes by a more or less large number of transverse passages, and sometimes border to border, the ribs, however, always remaining apparent.

Of the numerous genera referred to this family the following are represented by species in the American Tertiary:

Membraniporella Smitt, 1873. Cenomanian–Recent.
Cribrilina Gray, 1848. Midwayan–Recent.
Puellina Jullien, 1886. Senonian–Recent.
Distansescharella D'Orbigny, 1852. Senonian–Jacksonian.
Gephyrotes Norman, 1903. Jacksonian–Recent.
Metracolposa, new genus. Jacksonian.
Corbulipora MacGillivray, 1895. Eocene, Miocene.
Acanthocella, new genus. Jacksonian–Recent.
Cribrendoecium, new genus. Jacksonian.
Arachnopusia Jullien, 1886. Vicksburgian–Recent.

METRACOLPOSA, new genus.

(*Metra*, womb or ovicell; *kolpos*, a hollow, referring to the deeply embedded ovicell in the distal zoœcia).

The costules are separated by numerous lacunae. The apertura is semilunar. The operculum in opening closes the ovicell. The ovicell is large and deeply embedded in the distal zoœcia. The ovicelled zoœcia have a large apertura.

Genotype.—*Metracolposa robusta*, new species. Jacksonian.

METRACOLPOSA ROBUSTA, new species.

Plate 3, fig. 6.

Description.—The zoarium is free, bilamellar, large (1 to 2 centimeters in width), solid, robust. The zoœcia are distinct, elongated, elliptical; the frontal is somewhat convex; the costules are transverse at the top, radial below; they number from seven to nine pairs and are separated by four or five large lacunae; the lumen pores are small and irregular. The apertura is transverse, semielliptical with a straight or slightly convex proximal border; it is bordered distally by a very thin, incomplete peristome. The ovicell is large and deeply embedded in the distal zoœcia, elongated, salient, convex, decorated in front with a deltoid carina; it opens above the apertura and probably was closed by the operculum when it opened. The apertura of the ovicelled zoœcia is larger. A small triangular distal avicularium is placed either on the right or left of the apertura.

Measurements.—Apertura (ordinary) $\begin{cases} ha=0.10\text{ mm.} \\ la=0.20\text{ mm.} \end{cases}$

Apertura (ovicelled) $\begin{cases} ha=0.12-0.14\text{ mm.} \\ la=0.28-0.30\text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=0.96-1.00\text{ mm.} \\ lz=0.44-0.46\text{ mm.} \end{cases}$

The zoœcial width is rather variable; there are some zoœcia which measure 0.51 mm., in which case the costules are radially arranged.

The avicularia are rather rare; their point is directed toward the median axis of the zoœcia above the apertura; sometimes they are vertical; when well preserved, they have a calcareous pivot.

Occurrence.—Middle Jacksonian (Castle Hayne beds): Wilmington, North Carolina (very common).

Type.—Cat. No. 62586, U.S.N.M.

ACANTHOCELLA, new genus.

(*Acantha*, spine.)

The costules bear a row of very prominent lumen pores and are separated by lacunae of greater or less size. The apertura is semilunar. The ovicell is hyperstomial and its orifice is not in contact with the operculum.

Genotype.—*Cribrilina tubulifera* Hincks, 1881, from Australian seas.

Range.—Jacksonian–Recent.

ACANTHOCELLA ERINACEA, new species.

Plate 4, fig. 1.

Description.—The zoarium incrusts shells and bryozoa or creeps over algae. The zoœcia are distinct, very slightly elongated, subcircular; the frontal is very convex; the costules are thick, separated by the lacunae, ornamented by three, very prominent, hollow spines corresponding to the lumen pores. The apertura is semilunar with a straight proximal border; the peristome is distal and bears four large, hollow spines. The ovicell is hyperstomial, buried in the distal zoœcia, globose, not closed by the operculum, ornamented with small, remote punctations.

Measurements.—Aperture $\left\{\begin{array}{l} ha=0.09 \text{ mm.} \\ la=0.11\text{–}0.12 \text{ mm.} \end{array}\right.$

Zoœcia $\left\{\begin{array}{l} Lz=0.75\text{–}0.80 \text{ mm.} \\ lz=0.50\text{–}0.65 \text{ mm.} \end{array}\right.$

Variations.—The sharp points which decorate this species give it the spinous aspect of the hedge hog. It is very variable in its micrometrical dimensions and its gemmation; the zoœcia are oriented in the most unexpected and divergent manner.

Occurrence.—Middle Jacksonian (Castle Hayne limestone): Wilmington, North Carolina (rare).

Type.—Cat. No. 62587, U.S.N.M.

CRIBRENDOECIUM, new genus.

(Abbreviation of "Cribrilina with endozoœcial ovicell.")

The ovicell is endozoœcial. The costules are separated by a small initial slit and some medium sized lacunae; they have no lumen pores. The apertura is formed of a semilunar anterior portion and a larger and concave posterior part separated by two cardelles. The apertura of the ovicelled zoœcia is larger. Large interzoœcial avicularia are present.

Genotype.—*Cribrendoecium tenuicostulatum*, new species. Jacksonian.

CRIBRENDOECIUM TENUICOSTULATUM, new species.

Plate 4, fig. 2.

Description.—The zoarium incrusts shells. The zoœcia are distinct, elongated, separated by a furrow, elliptical, fusiform; the frontal is convex; the costules are very thin, numerous, without lumen pores, and separated by very small lacunae. The aperturae of the ordinary zoœcia are formed of a semilunar anterior and a very large, straight posterior part separated by two small cardelles; the apertura of the ovicelled zoœcia is larger and its posterior portion is convex. The ovicell is endozoœcial and exteriorly is prominent and transverse; it is formed of two calcareous deposits; the outer one is incomplete and leaves two lateral cicatrices in the form of a cross. The avicularia are interzoœcial and are elongated, spatulate, perforated by a long slit and generally without pivot.

Measurements.—Ordinary aperture $\left\{\begin{array}{l} ha=0.09\text{ mm.} \\ la=0.11\text{ mm.} \end{array}\right.$

Ovicelled aperture $\left\{\begin{array}{l} ha=0.10\text{ mm.} \\ la=0.13\text{ mm.} \end{array}\right.$

Zoœcia $\left\{\begin{array}{l} Lz=0.50\text{–}0.60\text{ mm.} \\ lz=0.25\text{–}0.35\text{ mm.} \end{array}\right.$

This species must not be confounded with any species of the genus *Figularia* Jullien, which is provided with a hyperstomial ovicell.

Occurrence.—Middle Jacksonian (Castle Hayne limestone): Wilmington, North Carolina (rare).

Type.—Cat. No. 62588, U.S.N.M.

Family ACROPORIDAE Canu, 1913.

The zoœcia are indistinct and their frontal is thickened. The ascopore, perforating the frontal, opens into the zoœcia below the operculum. The hyperstomial ovicell is deeply immersed and invisible exteriorly. The apertura is buried at the bottom of a long peristomie. There are some frontal avicularia and some peristomial avicularia.

The characteristics of this family are not yet sufficiently studied; the recent specimens are rare and the sections made of the fossil forms are often difficult to interpret.

We are able to distinguish the principal genera only by the nature of their frontal.

Following the Membraniporae, these are the most ancient Cheilostome fossils known.

The genera of this family and their range are indicated below: All are represented in the early Tertiary of North America.

Acropora Reuss, 1869. Maastrichtian–Recent.
Gastropella, new genus. Midwayan–Jacksonian.
Pachytheca Canu, 1913. Campanian–Midwayan.
Beisselina Canu, 1913. Cenomanian–Jacksonian.

GASTROPELLA, new genus.

(*Gaster*, stomach; *ope*, small opening.)

An Acropora having a smooth frontal garnished laterally with areolae.

Genotype.—*Gastropella ventricosa*, new species.

Range.—Midwayan–Jacksonian.

GASTROPELLA VENTRICOSA, new species.

Plate 4, fig. 3.

Description.—The zoarium is free, cylindrical, bifurcated. The zoœcia are large, elliptical, swollen; the frontal is smooth, convex, garnished laterally with some large areolae. The ascopore is very large, not salient, placed in the upper third of the zoœcia. The peristome is salient and sharp; the peristomice is oblique, orbicular or elliptical. The ovicell is entirely hidden within the thickness of the frontal of the distal zoœcium.

Measurements.—Peristomice $\left\{\begin{array}{l} hpe = 0.10\text{–}0.15 \text{ mm.} \\ lpe = 0.15 \text{ mm.} \end{array}\right.$

Zoœcia $\left\{\begin{array}{l} Lz = 0.85 \text{ mm.} \\ lz = 0.40 \text{ mm.} \end{array}\right.$

Affinities.—There is frequently a very small peristomial avicularium. On the longitudinal sections the ascopore manifestly opens below the apertura and it often appears like a large funnel. On the ovicelled zoœcia there is a sort of clamp which is perhaps intended to fasten the operculum during the expulsion of the larva.

Occurrence.—Midwayan: Mabelvale near Little Rock, Arkansas (common).

Type.—Cat. No. 62589, U.S.N.M.

Family HIPPOTHOIDAE Levinsen, 1909.

The zoœcia become calcified from behind in successive zones forward, leaving at the surface more or less salient lines. the lines of growth, and are furnished with a variable number of dietellae.

The genera of this family are as follows, those represented in American deposits being marked with an asterisk.

* *Hippothoa* Lamouroux, 1821. Lutecian–Recent.
Chorizopora Hincks, 1880. Recent.
* *Trypostega* Levinsen, 1909. Jacksonian–Recent.
Haplopoma Levinsen, 1909. Tortonian–Recent.
Dacryopora Lang, 1914. Cenomanian–Senonian.

Family ESCHARELLIDAE Levison, 1909.

The ovicell is hyperstomial. The operculum is rigid and chitinous; it closes the aperture, the compensatrix, and often the ovicell; its form is in rapport with the hydrostatic system, and the passage of the eggs into the ovicell.

This family is the reunion of the old families of Microporellidae, Myriozoidae, and Escharidae (part) of Smitt and Hincks. Levinsen, in 1909, having proved the identity of the larvae formed the family of Escharellidae, but the name is badly chosen, for it is based on an archaic genus which the more recent work will not permit us to employ.

According to the form of the operculum we may class the numerous genera of this family in the following four large groups:

Schizoporellae,
Hippoporae,
Peristomellae,
Microporellae.

Evidently the hydrostatic and reproductive functions are identical in each but they operate in a quite variable manner. These variations added to those of calcification, which is also an important function, permit the establishment of a large number of genera almost all rather natural however, which facilitate the study of this very important family.

First Group. SCHIZOPORELLAE.

The operculum is semilunar; the proximal border bears a slit or rimule which opens the compensatrix. The muscular attachments are two small, symmetrical tuberosities more or less removed from the border. When the proximal border of the aperture is linear it serves as a pivot for the operculum; when it is arched and the rimule very large, the pivot of the operculum is formed by two projecting interior condyles.

The genera of this group with their geologic range are listed below; those marked with an * are represented in the American Eocene and Oligocene:

**Schizopodrella*, new genus. Lutecian–Recent.
**Stephanosella*, new genus. Jacksonian–Recent.
**Lacerna* Jullien, 1888. Lutecian–Recent.
**Buffonella* Jullien, 1888. Senonian–Recent.
**Arthropoma* Levinson, 1909. Jacksonian–Recent.
Phonicosia Jullien, 1888. Helvetian–Recent.
**Schizomavella*, new genus. Jacksonian–Recent.
**Dakaria* Jullien, 1903. Lutecian–Recent.
**Metroperiella*, new genus. Jacksonian–Recent.
**Emballotheca* Levinsen, 1909. Jacksonian–Recent.
**Tetraplaria* Tenison Wood, 1878. Jacksonian–Recent.
Nimba Jullien, 1903. Recent.
Gemellipora Smitt, 1872. Miocene–Recent.
Characodoma Maplestone, 1900. Miocene.

SCHIZOPODRELLA, new genus.

The ovicell is hyperstomial. It opens above the apertura by a special opening closed by a special membrane and without connection with the operculum; it surmounts this apertura without inclosing it. The inferior border of the apertura is somewhat concave and bears a narrow rimule. The frontal is a tremocyst direct or covering a very thin olocyst finely perforated. The muscular attachments are generally at a distance from the border of the operculum. There are oral glands.

Genotype.—*Schizopodrella* (*Lepralia*) *unicornis* Johnston, 1847.

Range.—Lutecian–Recent.

STEPHANOSELLA, new genus.

(*Stephanos*, crown, in reference to the crown-like border of the ovicell.)

The ovicell is hyperstomial and imbedded in the distal zoœcia. It opens above the apertura by an especial orifice. The frontal is a smooth olocyst. No spines. The ovicelled zoœcia have a large apertura and their avicularium is frontal.

Genotype.—*Stephanosella* (*Lepralia*) *biaperta* Michelin, 1845.

Range.—Jacksonian–Recent.

SCHIZOMAVELLA, new genus.

(*Schizos*, slit; *mav*, abbreviation of median avicularium.)

The operculum closes the ovicell. The muscular attachment is generally in the immediate vicinity of the border of the operculum. The rimule is wide and arched. The frontal is a tremocyst. A median avicularium occurs on the front wall. There are small oral glands.

Genotype.—*Schizomavella* (*Lepralia*) *auriculata* Hassall, 1842.

Range.—Jacksonian–Recent.

METROPERIELLA, new genus.

(*Metra*, womb (ovicell); *peri*, around, in reference to the ovicell entirely surrounding the apertura.)

The ovicell is hyperstomial and completely surrounds the apertura. The rimule is a large rounded sinus. The frontal is a tremocyst bearing a median avicularium.

Genotype—*Metroperiella* (*Schizoporella*) *lepralioides* Calvet, 1903.

Range.—Jacksonian–Recent.

METROPERIELLA BIPLANATA, new species.

Plate 4, fig. 4.

Description.—The zoarium is free, formed of two flat lamellæ, back to back and inseparable. The zoœcia are much elongated, distinct, fusiform; the frontal is convex and formed of a tremocyst with numerous very fine pores. The apertura is oval, formed of a semilunar anter and with a wide, rounded rimule, separated by two inner condyles. The ovicell is hyperstomial, large, globular, salient; it completely surrounds the apertura, forming about it a very pronounced peristomie, in which is placed its special orifice; the peristomice is very irregular. The median avicularium is small, little salient, in the immediate vicinity of the rimule.

Measurements.—Aperture $\left\{\begin{array}{l} ha\text{—}0.16\text{—}0.18\text{ mm.} \\ la\text{—}0.14\text{ mm.} \end{array}\right.$

Zoœcia $\left\{\begin{array}{l} Lz\text{—}1.00\text{—}1.10\text{ mm.} \\ lz\text{—}0.50\text{—}0.60\text{ mm.} \end{array}\right.$

Occurrence.—Middle Jacksonian (Castle Hayne limestone): Wilmington, North Carolina (very common).

Type.—Cat. No. 62590, U.S.N.M.

Second Group. HIPPOPORAE.

The operculum has a projection on each side for muscular attachment; it is generally thick. The apertura bears two lateral denticles or cardelles serving as a pivot for the operculum. The ovicell is always hyperstomial.

All of the four genera comprising the Hippoporae are represented by rather numerous species in the Early Tertiary of North America.

Hippoporina Neviani, 1895. Danian–Recent.
Hippomenella, new genus. Lutecian–Recent.
Hippodiplosella Canu, 1915. Jacksonian–Recent.
Hippozeugosella, new genus. Priabonian–Miocene.

HIPPOMENELLA, new genus.

(*Hippos*, horse; *mene*, moon, referring to the horseshoe form of the apertura and to the areas which decorate the ovicell.)

The apertura bears two small cardelles placed very low and separating a large porta from a small vanna; it is always semi-elliptical (in the interior). The ovicell, hyperstomial, is deeply imbedded in the distal zoœcia; it opens by a large opening above the apertura, but it is never closed by the operculum. The frontal is formed of an olocyst perforated laterally by some areolae and supporting a pleurocyst more or less developed. The ovicell bears laterally two areas in the form of a lunar crescent and more or less perforated. There are nearly always some spines and some avicularia.

Genotype.—*Hippomenella* (*Lepralia*) *mucronelliformis* Waters, 1899.

Range.—Lutecian–Recent.

HIPPOZEUGOSELLA, new genus.

(*Hippos*, horse, in reference to the horseshoe form of the aperture; *zuegos*, a pair, referring to the arrangement of the zoœcia.)

The ovicell is hyperstomial, its orifice is large, without rapport with the operculum, and is closed by a special membrane. The apertura is elliptical; two small cardelles separate the anter from the somewhat smaller poster. The frontal is a tremocyst with small pores. The zoarium is free; the zoœcia are joined two by two. No spines. Avicularia present.

Genotype.—*Hippozeugosella* (*Bactridium*) *hagenowi* Reuss 1847.

Range.—Priabonian–Miocene.

HIPPOZEUGOSELLA TEGES, new species.

Plate 4, fig. 5.

Description.—The zoarium is free, erect, unilamellar, formed of two longitudinal rows of zoœcia; on the dorsal the zoœcia are convex, alternate, and have the aspect of a mat. The zoœcia are distinct, elongate, hexagonal; the frontal is convex and formed of a tremocyst with very small pores. The apertura is orbicular and formed of a large anter, and with a smaller poster separated by two very small cardelles; the peristome is complete, broad, and infundibuliform. On the peristome itself and near the zoarial axis there is a small round avicularium provided with a pivot. Ovicell?

Measurements.—Aperture $\left\{\begin{array}{l} ha=0.11 \text{ mm.} \\ la=0.11 \text{ mm.} \end{array}\right.$

Zoœcia $\left\{\begin{array}{l} Lz=0.70\text{–}0.75 \text{ mm.} \\ lz=0.45 \text{ mm.} \end{array}\right.$

Affinities.—The frontal pores are very small and are easily filled up. The frontal and the dorsal are covered with very small granulations. The formation of the branches is effected by the union of two zoœcia arising from two superposed zoœcia.

Occurrence.—Upper Jacksonian (Zeuglodon zone); Cocoa post office, Choctaw County, Alabama (very rare).

Upper Jacksonian (Ocala limestone): Chipola River, east of Marianna, Jackson County, Florida (common).

Type.—Cat. No. 62591, U.S.N.M.

Third Group. PERISTOMELLAE.

The apertura is oblique without lyrule, cardelles, or rimule. The ovicell is hyperstomial and imbedded in the distal zoœcia. It opens above (and nearly opposite) the oblique apertura and below the frontal mucro in a locella where the operculum operates.

The principal genera of this group are listed below with their range; all occur in the North American Eocene and Oligocene.

Bathosella, new genus. Cretaceous–Midwayan.
Romancheina Jullien, 1888. Jacksonian–Recent.
Peristomella Levinsen, 1902. Lutecian–Recent.
Exochella Jullien, 1888. Rocanean–Recent.
Didymosella, new genus. Vicksburgian–Recent.

BATHOSELLA, new genus.

(*Bathos*, depth.)

The apertura is oblique, without lyrule, cardelles, or rimule. The ovicell is embedded in the distal zoœcia. It opens above the apertura and below the frontal mucron in the locella. The frontal is a thick olocyst, more or less covered by a pleurocyst. The zoœcia are indistinct. The avicularia are simple and irregularly placed. The areolae are very rare. No spines.

Genotype.—Bathosella (*Mucronella*) *aspera* Ulrich, 1901.

Range.—Uppermost Cretaceous, Midwayan.

DIDYMOSELLA, new genus.

(*Didymos*, double, having reference to the two large frontal pores.)

The frontal is a tremocyst. Below the apertura there are two large pores which open into the zoœcia under the operculum. Spines. There is a large marginal avicularium, triangular, with pivot, arranged transversally.

Genotype.—Didymosella (*Porina*) *larvalis* MacGillivray, 1868.

Range.—Vicksburgian–Recent.

DIDYMOSELLA CRASSA, new species.

Plate 4, fig. 6.

Description.—The zoarium is unilamellar and very thick; it creeps over algae. The zoœcia are elongated, distinct, in the form of a bottle; the frontal is convex and formed of a tremocyst with large, crowded tubular pores. The apertura is elliptical and transverse; the salient peristome bears the traces of very small spines; two enormous pores are adjacent to the peristome. The avicularium is marginal, triangular, very large, with pivot, and arranged transversely. The lower face is smooth and presents some large, scattered concavities.

Measurements.—Aperture $\begin{cases} ha=0.10 \text{ mm.} \\ la=0.11\text{–}0.12 \text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=0.60\text{–}0.70 \text{ mm.} \\ lz=0.40 \text{ mm.} \end{cases}$

Variations.—In longitudinal section we are better able to comprehend the organization of this species. In particular the dorsal wall is a very thick olocyst, the cavities observed on the exterior do not perforate it; they limit the zoœcia between which they are hollowed out. The large frontal pores open into the same zoœcia; the tremopores are tubules; finally, the avicularium is a very large chamber hollowed in the thickness of the frontal wall.

Occurrence.—Vicksburgian: West bank of Conecuh River, Escambia County, Alabama (common).

Type.—Cat. No. 62592, U.S.N.M.

Fourth Group. MICROPORELLAE.

Genera of this group are not represented in the Early Tertiary.

DIVERS GENERA.

The genera listed under this heading have some peculiar characters which do not permit of their classification in any of the large groups cited; but they appear really to belong to the same general family.

The principal genera, with their ranges and American occurrence (marked *) are:

* *Houzeauina* Pergens, 1889. Jacksonian, Priabonian.
**Cyclicopora*, Hincks, 1884. Jacksonian–Recent.
Kymella, new genus. Recent.
Anarthropora Smitt, 1867. Latdorfian–Recent.
**Aimulosia* Jullien, 1888. Wilcoxian–Recent.

KYMELLA, new genus.

(*Kyma*, undulation, in allusion to the undulated form of the proximal border of the operculum.)

The hyperstomial ovicell is always closed by the operculum. The frontal is bordered laterally by areolae. The apertura bears a very wide rimule.

Genotype.—Kymella (*Cyclicopora*) *polaris* Waters, 1904. Recent.

STOMACHETOSELLIDAE, new family.

The frontal is thick and occasions the formation of a peristomie. The apertura is generally orbicular or semilunar with a very concave proximal border. The peristomice is always different in form;

it is notched below by a rimule-spiramen designed to conduct the water into the compensatrix. The ovicell is hyperstomial, embedded in the distal zoœcia; it opens above the apertura in the peristomie. No peristome, lyrule, or cardelles.

This family differs from the Reteporidae in the absence of vibices, vacuoles, and reticulated zoarium, in the cleft on the ovicell, and in the presence of a peristomie. It resembles this family in its embedded ovicell and its rimule-spiramen.

It differs from the Smittinidae in the absence of lyrule, cardelles, median avicularium, and of a peristome with spines. It possesses the same embedded ovicell opening into the peristomie. In the Smittinidae the peristomie is formed by the development of a peristome with spines; in the Stomachetosellidae it is formed by the thickening of the frontal.

We have founded our generic classification on the aspect of the ovicell and on the variations of the escape of the larvae, an important function. All the other functions, reproduction, hydrostatic, calcification, and passage of the eggs remain exactly the same.

STOMACHETOSELLA, new genus.

(*Stoma*, mouth; *ochetos*, small canal.)

The ovicell entirely surrounds the apertura. The frontal is a tremocyst with wide-mouthed tubules. No avicularia. The peristomice of the ovicelled zoœcia possesses a straighter rimule-spiramen.

Genotype.—*Stomachetosella crassicollis*, new species. Vicksburgian.

STOMACHETOSELLA CRASSICOLLIS, new species.

Plate 4, fig. 7.

Description.—The zoarium is free, bilamellar, formed of broad, undulated branching fronds, more or less flabelliform. The zoœcia are elongated, little distinct; the frontal is convex, smooth, thick, and salient around the apertura, and formed by a tremocyst with large tubules resting on a thin olocyst. The apertura (interior) is orbicular; the peristomice is provided with a triangular rimule-spiramen; the false peristome is thick and smooth. The ovicell is hyperstomial, buried, globular, salient, ornamented with tubular tremopores; it opens into the peristomie; it is possibly closed by the operculum (?); the rimule-spiramen of the ovicelled zoœcia is longer and linear. Laterally, near the apertura there is often a triangular, improminent avicularium, the beak directed above, with pivot.

Measurements.—Peristomice (exterior) $\left\{\begin{array}{l} hpe=0.10\text{–}0.15\ \text{mm.} \\ lpe=0.15\text{–}0.20\ \text{mm.} \end{array}\right.$

Apertura (interior) $\left\{\begin{array}{l} hpe=0.12\text{–}0.15\ \text{mm.} \\ lpe=0.12\text{–}0.15\ \text{mm.} \end{array}\right.$

Zoœcia $\left\{\begin{array}{l} Lz=0.90\ \text{mm.} \\ lz=0.30\text{–}0.40\ \text{mm.} \end{array}\right.$

This species with its enormous, solid walls, appears robust and resistant. Nevertheless, this is not the case. It was rapidly exterminated and never had a large geographic distribution. This is frequent in the bryozoa, where pliancy is a better sign of longevity and resistance.

Occurrence.—Vicksburgian: West bank Conecuh River, Escambia County, Alabama (very common).

Type.—Cat. No. 62593, U.S.N.M.

ENOPLOSTOMELLA, new genus.

(*Enoplis*, armed; *stoma*, mouth.)

The apertura and peristomice of the ovicelled zoœcia are identical with the apertura and peristomice of the ordinary zoœcia. The frontal is a tremocyst with wide-mouthed tubules. The ovicell does not entirely surround the peristomice. There is an avicularium in the peristomie in the immediate vicinity of the peristomice.

Genotype.—*Enoplostomella defixa*, new species.

Range.—Jacksonian-Vicksburgian.

ENOPLOSTOMELLA DEFIXA, new species.

Plate 4, fig. 8.

Description.—The zoarium is free, cylindrical, vinculariform, formed of from 6 to 7 longitudinal rows of zoœcia. The zoœcia are indistinct; the frontal is little thickened, convex, formed of a tremocyst with large tubules placed above an olocyst with pores. The apertura (interior) is formed of a semilunar anter and of a concave poster; the peristomice (exterior) is elongated, embedded, provided with a triangular rimule-spiramen. The ovicell is hyperstomial, buried in the distal zoœcia, globular, salient, decorated with large tremopores; it opens largely into the peristome. The oral avicularium is adjacent to the peristomice and placed somewhat obliquely; it is triangular, rather long, and provided with a pivot; the beak is turned outward.

Measurements.—Apertura (interior) $\left\{\begin{array}{l} ha=0.15\ \text{mm.} \\ la=0.15\ \text{mm.} \end{array}\right.$

Peristomice (exterior) $\left\{\begin{array}{l} hpe=0.14\text{–}0.16\ \text{mm.} \\ lpe=0.18\text{–}0.20\ \text{mm.} \end{array}\right.$

Zoœcia $\left\{\begin{array}{l} Lz=0.90\text{–}1.00\ \text{mm.} \\ lz=0.40\ \text{mm.} \end{array}\right.$

Occurrence.—Vicksburgian; 1 mile north of Monroeville, Alabama (very common).

Type.—Cat. No. 62594, U.S.N.M.

SCHIZEMIELLA, new genus.

(*Schizos*, slit; *emi*, abbreviation of peristomie.)

The frontal of the ovicell is very fragile. The apertura is schizoporellidan with wide rimule. The rimule-spiramen is inconstant. The tubules are reunited on their commonage.

Genotype.—*Schizemiella claibornica*, new species. Claibornian.

SCHIZEMIELLA CLAIBORNICA, new species.

Plate 4, fig. 9.

Description.—The zoarium is free, bilamellar with inseparable lamellae. The zoœcia are indistinct; the frontal is thickened, little convex, formed of a tremocyst with large irregular tubules placed on a thin olocyst with very small pores in quincunx. The apertura is formed of an ogival anter and a concave poster with a very wide rimule; the peristomice is elongated, embedded, with a very wide, irregular rimule-spiramen. The ovicell is hyperstomial and opens largely into the peristomie; it is little globular, hardly salient; covered by a smooth or perforated, very fragile wall: the peristomice is elliptical and transverse. The avicularium is triangular, the beak directed above, adjacent to the peristomice which it deforms, provided with a pivot.

Measurements.—Peristomice (exterior) $\begin{cases} hpe=0.20 \text{ mm.} \\ lpe=0.14\text{–}0.16 \text{ mm.} \end{cases}$

Apertura (interior) $\begin{cases} ha=0.12 \text{ mm.} \\ la=0.11 \text{ mm.} \end{cases}$

Zoœcia (interior) $\begin{cases} Lz=0.54 \text{ mm.} \\ lz=0.30 \text{ mm.} \end{cases}$

Variations.—In the interior the tremopores are regularly placed in quincunx; on the exterior they are very irregularly disposed, larger and less numerous.

The rimule of the peristomice is very irregular. In reality the form of the apertura belongs to the group of very typical *Schizoporella* and the operculum ought to be chitinized enough to insure sufficiently the opening of the compensatrix by itself.

Occurrence.—Claibornian (Gosport); Claiborne, Alabama (rare). One mile west of Rockville, Clarke County, Alabama (rare).

Type.—Cat. No. 62595, U.S.N.M.

METRADOLIUM, new genus.

(*Metra*, womb; *dolios*, deceptive, having reference to the deceptive aspect of the ovicells.)

The ovicelled zoœcia, different in form from the others, have a peristomice in the form of a lunar crescent without rimule-spiramen. The frontal is a tremocyst with tubules.

Genotype.—*Metradolium dissimilis*, new species. Jacksonian.

METRADOLIUM DISSIMILIS, new species.

Plate 4, fig. 10.

Description.—The zoarium is free, bilamellar, branching; the fronds are wide, thick, distorted or undulated, dichotomous. The zoœcia are distinct, elongated, elliptical. The frontal is a tremocyst with tubules resting on an olocyst with very small pores corresponding to the tubules. The peristomie is deep and very oblique; the apertura is small and suborbicular; the peristomice is orbicular; the spiramen is median, more or less distant from the peristomice. There are two oral avicularia symmetrically placed but dissimilar in form and size; the smaller is round, simple, nonsalient; the larger is enormous, oval, salient, with pivot. The ovicell is enormous, buried in the distal zoœcia, hyperstomial but opening largely into the peristomie; salient and globular; its peristomice has the form of a lunar crescent; the ovicelled zoœcia bear only a small avicularium with pivot.

Measurements.—Peristomice (exterior) $\begin{cases} hpe=0.14\text{–}0.16 \text{ mm.} \\ lpe=0.15\text{–}0.20 \text{ mm.} \end{cases}$

Zoœcia (exterior) $\begin{cases} Lz=0.74\text{–}0.76 \text{ mm.} \\ lz=0.40\text{–}0.50 \text{ mm.} \end{cases}$

Occurrence.—Middle Jacksonian: Wilmington, North Carolina (very common), and various localities in South Carolina and Georgia.

Type.—Cat. No. 62596, U.S.N.M.

LEIOSELLA, new genus.

(*Leios*, smooth, having reference to the nature of the frontal.)

The frontal is an olocyst. The peristomice of the ovicelled zoœcia is of different form from that of the other zooecia; it is a lunar crescent and deprived of rimule-spiramen.

Genotype.—*Leiosella rostrifera*, new species. Vicksburgian.

This genus differs from *Metradolium* only in the nature of the frontal, which is here a very thick olocyst.

LEIOSELLA ROSTRIFERA, new species.

Plate 5, fig. 1.

Description.—The zoarium is free, bilamellar; the fronds are narrow, flat, claviform, bifurcated. The zoœcia are elongated, distinct, ovoid; the frontal is smooth, convex, formed by a thick olocyst. The peristomice is irregular; the rimule-spiramen is bordered laterally by the oral avicularium. The apertura is elongated, ovoid, very oblique. The oral avicularium is large, transverse, salient, with the beak strong and curved; it is provided with a pivot and a large mandible, more or less spatulate. On the frontal there are two small, elliptical avicularia with round mandible.

Occurrence.—Vicksburgian: One mile north of Monroeville, Alabama (very common).

Type.—Cat. No. 62597, U.S.N.M.

METROCRYPTA, new genus.

(*Metra*, womb, in reference to the ovicell; *cryptos*, hidden.)

The frontal is a tremocyst with tubules. The rimule-spiramen is wide and of very little depth. Ovicell unknown.

Genotype.—*Metrocrypta bucculenta*, new species. Jacksonian.

The ovicell of this genus is unknown; it is therefore very doubtful that the genus should be introduced into this family. The oral avicularium is very rare; however, its presence seems to us the best character for classification.

METROCRYPTA BUCCULENTA, new species.

Plate 5, fig. 2.

Description.—The zoarium is free, cylindrical, bifurcated. The zooecia are elongated, large, little distinct; the frontal is convex, porous, formed of a tremocyst placed on a thick olocyst. The peristomice is somewhat elongated, oval, its lower point formed of a wide rimule-spiramen; the peristomie is somewhat salient; the apertura (interior) is much smaller, orbicular, very oblique. The oral avicularium is very rare; it is quite large, prominent, triangular, adjacent to the peristomice, provided with a pivot placed very low.

Measurements.—Peristomice (exterior) $\begin{cases} hpe=0.30\text{–}0.35 \text{ mm.} \\ lpe=0.30 \text{ mm.} \end{cases}$

Apertura (interior) $\begin{cases} ha=0.15 \text{ mm.} \\ la=0.15 \text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=1.00 \text{ mm.} \\ lz=1.25 \text{ mm.} \end{cases}$

Occurrence.—Middle Jacksonian (Castle Hayne limestone): Wilmington, North Carolina (common).

Type.—Cat. No. 62598, U.S.N.M.

OCHETOSELLA, new genus.

(*Ochetos*, small canal.)

The ovicell is hyperstomial and deeply embedded in the distal zoœcium. The rimule-spiramen is replaced by a small canal supported by a peristomial projection. The frontal is an olocyst perforated laterally by some areolae and covered by a uniform pleurocyst.

Genotype.—Ochetosella jacksonica, new species.

Range.—Claibornian, Jacksonian.

At first glance, this genus appears close to *Palmicellaria*, but this is an error. The large avicularian mucro of that genus is replaced here by a small canal which is evidently the equivalent of the rimule-spiramen of the other genera of the family Stomachetosellidae. When it exists, the oral avicularium is indeed in its place in the immediate vicinity of the peristomice and of the rimule-spiramen.

OCHETOSELLA JACKSONICA, new species.

Plate 5, fig. 3.

Description.—The zoarium is free, erect, cylindrical, bifurcated, often anastomosing. The zoœcia are elongated, distinct, hexagonal, separated by a salient thread; the frontal is concave, bordered by large areolae, formed of a thin olocyst and covered by a uniform and finely granulated pleurocyst. The apertura is semilunar and invisible externally; the peristomice is very oblique, with undefined outlines, vaguely triangular. The ovicell is globular and deeply embedded in the distal zoœcia. The oral avicularium is rare.

Measurements.—Zoœcia $\begin{cases} Lz = 1.10\text{–}1.20 \text{ mm.} \\ lz = 0.50 \text{ mm.} \end{cases}$

Occurrence.—Upper Claibornian (Gosport sand): One mile southwest of Rockville, Clarke County, Alabama (very rare).

Lower Jacksonian: Jackson, Mississippi (very common).

Middle Jacksonian: Wilmington, North Carolina (very common), and various localities in South Carolina and Georgia.

Type.—Cat. No. 62599, U.S.N.M.

Family SMITTINIDAE Levinsen, 1909.

The ovicell which is hyperstomial and embedded in the distal zoœcia opens into the peristomie. The peristome is produced and channeled in front. The operculum is (not universally) very thin; the lower edge is straight or slightly curved inward and hardly separated from the ectocyst; the muscular attachments are usually a ridge on the border. There are very small oral glands often partly attached to the tentacular sheath. Spines.

This family is a very natural one, but unfortunately our knowledge of the anatomy and embryology is too slight to allow us to fix its exact limits. The development of the peristome is one of the essential characters; we continue to employ the same terminology as for the preceding families. The orifice of the peristome is the peristomice (secondary orifice of Hincks); it is irregular and its outlines are vague and undefined. The apertura is the zoœcial orifice closed by the operculum; it is not always visible externally. The internal tube formed by the development of the peristome is the peristomie.

The calcification functions as in other genera. Nevertheless the pleurocyst is a frequent occurrence, and the greater part of the time the two calcareous layers are separable.

Genus SMITTINA Norman, 1903.

1880. *Smittia* Hincks, British Marine Polyzoa, p. 340 (preoccupied).
1903. *Smittina* Norman, Notes on the Natural History of East Finmark, Annals and Magazine Natural History (7), vol. 12, p. 120.

In the apertura there is a lyrule and two cardelles. The frontal is an olocyst, perforated laterally with areolae and supporting a granular or costulate pleurocyst. The anterior indentation of the peristome contains an avicularium very often triangular.

Genotype.—Smittina (*Lepralia*) *reticulata* MacGillivray.

Range.—Lutecian–Recent.

This genus is represented in the American Early Tertiary by 14 new species and by *Smittina tubulata* Gabb and Horn, 1862, from the Vicksburgian, *S. strombecki* Reuss, 1866, from the Middle and Upper Jacksonian, and *S. angulata* Reuss, 1866, from the Jacksonian and Vicksburgian.

PLAGIOSMITTIA, new genus.

(*Plagios*, transverse, referring to the zoœcial arrangement.)

The ovicell opens into the peristomie. The frontal is a tremocyst. The avicularium is placed in the peristomie. The zoœcia are oriented transversally to the zoarial fronds.

Genotype.—Plagiosmittia regularis, new species. Jacksonian.

This genus differs little from *Porella* Gray, 1848, in the nature of its functions. The difference lies in the irregularity of the place of the median avicularium and in the disposition of the zoœcia on the fronds. Possibly it should be considered only a subgenus.

PLAGIOSMITTIA REGULARIS, new species.

Plate 5, fig. 4.

Description.—The zoarium is bilamellar; the fronds are flat, narrow bifurcated. The zoœcia are much elongated, distinct, separated by a thread or a furrow, and are much narrowed proximally. The frontal is flat or little convex, and formed of a tremocyst with numerous crowded pores. The peristome is thin, salient; the aperture is semilunar, with a very concave proximal border; the peristomice is irregular, but it often contains a false rimule limited by the avicularium. The ovicell is globular, little salient; it is formed of a large circular area with small numerous pores, surrounded by an improminent smooth collar; it is embedded in the distal zoœcia and opens into the peristomie. The avicularium is peristomial, placed more or less laterally; the mandible moves in the peristomie.

Occurrence.—Middle Jacksonian: Wilmington, North Carolina (common).

Upper Jacksonian (Ocala limestone): Old factory, one-half mile above Bainbridge, Georgia (rare).

Vicksburgian: Salt Mountain, 5 miles south of Jackson, Alabama (very rare).

Type.—Cat. No. 62600, U.S.N.M.

Genus MUCRONELLA Hincks, 1880.

1880. *Mucronella* HINCKS, British Marine Polyzoa, p. 360.

The frontal is surrounded by areolae and covered by a pleurocyst, costulate or granular. There is a lyrule, and often some cardelles, in the peristomice inferiorly.

Genotype.—*Mucronella* (*Lepralia*) *peachi* Johnston, 1847.

Range.—Jacksonian–Recent.

The limits of this genus were rigorously established in 1904 by Waters. It differs from *Smittina* in the replacement of the avicularium by a mucro; that is to say, by an organ which we know to be almost equivalent. Several new species are known in our American Early Tertiary.

Genus RHAMPHOSTOMELLA Lorenz, 1886.

1886. *Rhamphostomella* LORENZ, Bryozoen von Jan Mayen, Die Oesterreichische Polarstation, Jan Mayen, vol. 3, p. 11.

The operculum closes the ovicell, which is hyperstomial; it is thin and delicate, but there is a raised circular ridge. There is a very narrow lyrule before an asymmetrical sinus. The frontal is an olocyst with costules. Before the orifice of the ovicell, and at the same height, there is a very large avicularium, oblique, salient, and placed eccentrically. Eighteen tentacles. The oral glands are much developed.

Genotype.—*Rhamphostomella costata* Hincks, 1889.

Range.—Priabonian–Recent.

A new variety of *Rhamphostomella brendolensis* Waters, 1891, and two new species occur in the American Eocene.

CYSTISELLA, new genus.

(*Cystis*, bladder, pouch.)

The frontal is an olocyst. It bears a very wide avicularian chamber in which there is a pair of large glands. The mandibles have a lucida in the middle. (Waters).

Genotype.—*Cystisella* (*Porella*) *saccata* Busk, 1856.

Range.—Midwayan–Recent.

"In *Porella saccata* it [the ovicell] is many-layered, as thin calcareous layers, presumably gymnocyst [our olocyst] layers, continually grow over the oœcium, not only from the distal zoœcium but also from the two neighboring zoœcia, and we can see, as a rule, three, distinctly separated, thin covering plates on their surface."[1]

CYSTISELLA MIDWAYANICA, new species.

Plate 5, fig. 6.

Description.—The zoarium incrusts shells. The zoœcia are distinct, somewhat elongated, hexagonal, separated by a furrow or a thin salient thread; the frontal is very convex and very finely granulated. The peristome is thin, little salient in its distal part; it bears some spines; the peristomice is elliptical and deformed inferiorly by the avicularium. The avicularium forms a long chamber, median and conical; its orifice is little circular and turned toward the apertura.

Measurements.—Peristomice $\begin{cases} hpe = 0.10 \text{ mm.} \\ lpe = 0.14 \text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz = 0.40 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{cases}$

Occurance.—Midwayan (Clayton limestone): Luverne, Crenshaw County, Alabama (very rare).

One mile west of Fort Gaines, Georgia (rare).

Type.—Cat. No. 62902, U.S.N.M.

Genus PORELLA Gray, 1848.

1848. *Porella* GRAY, List of British Animals in collection British Museum. Centroniae, pp. 127, 148.

The ovicell opens into the peristomie; it is porous, imbedded in the distal zoœcium. The apertura is semilunar. Neither lyrule nor cardelles. The operculum is almost straight in its proximal part, with rounded corners; there is a muscular prominence a little distance from the edge. In front of the apertura there is an avicularium; the mandible is semicircular and has well-marked thickenings formed of diagonal bars. The frontal is a tremocyst with tubules. Twenty tentacles.

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[1] Levinsen, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 336.

Genotype.—*Porella* (*Millepora*) *cervicornis* Pallas, 1766.

Range.—Lutecian–Recent.

This genus differs from *Smittina* only in the calcification; the tremocyst replaces the pleurocyst. There are, however, some other secondary differences. The mandible of the avicularium is semicircular; it is generally (but not universally) triangular in *Smittina*.

This is a prolific genus in the Early Tertiary of North America, 15 new species being known, represented in most cases by abundant specimens.

Genus UMBONULA Hincks, 1880.

1880. *Umbonula* HINCK, British Marine Polyzoa, p. 316.

There is neither lyrule nor cardelles. The apertura is suborbicular. The ovicell is hyperstomial and opens largely above the apertura. The frontal is a pleurocyst with costules surrounded by areolae. A prominent umbo immediately below the mouth, supporting an avicularium.

Genotype.—*Umbonula* (*Cellepora*) *verrucosa* Esper, 1791.

Range.—Lutecian–Recent. Represented by two species in the Vicksburgian of Alabama.

Genus PHOCEANA Jullien, 1903.

1903. *Phoceana* JULLIEN, Bryozoaires provenant des Campagnes de *l'Hirondelle*, p. 107.

The apertura is semicircular with poster slightly concave; it is deprived of cardelles and bears a pseudolyrule formed by the elevation of the peristomial wall. The operculum bears a chitinous mural rim incomplete at the level of the convexity of the upper border and little removed from the lateral borders.

Genotype.—*Phoceana columnaris* Jullien, 1903.

Range.—Jacksonian–Recent.

HIPPADENELLA, new genus.

(*Aden*, gland.)

The frontal is a pleurocyst surrounded by areolæ. The apertura bears two cardelles. The mandibles have a lucida in the middle. The avicularian chamber shows a double glandlike body and the protoplasmic mass.

Genotype.—*Hippadenella* (*Flustra*) *margaritifera* Quoy and Gaymard, 1833. Recent.

It seems to us that it would be better to classify this genus in the Hippoporinae, although all the authors are agreed in considering the genotype as belonging to the genus *Porella;* we can not maintain it there, the frontal being a pleurocyst and the apertura bearing cardelles.

Family RETEPORIDAE Smitt, 1867.

The ovicell is hyperstomial, much immersed in the distal zoœcium; it is largely open into the peristomie. The zoarium is generally reticulate; the dorsal face presents some projections or vibices without connection with zoœcia and contains interiorly some kenozoœcia (lacunae of Waters) more or less numerous and elongated. The reteporidan pore placed in front of the apertura is according to its situation an ascopore or a spiramen; 11 to 16 tentacles.

Genus RETEPORA Imperato, 1859.

1859. *Retepora* IMPERATO, Dell' historia naturale, book 28.

"This group has a fissure in the ovicell. The proximal edge of the operculum is nearly straight, and very similar throughout this group; labial avicularia occur in some but not in all. The oral glands are very well developed" (Waters). The reteporidan pore is a spiramen.

Genotype.—*Retepora cellulosa* Linnæus-Smitt, 1867.

Range.—Jacksonian–Recent.

HIPPELLOZOON, new genus.

(*Hippos*, horse, referring to the horseshoe shape of the apertura.)

The ovicell is widely open. There is neither labial avicularium nor reteporidan pore. The operculum is contracted in the middle, having long bands at the sides for the muscular attachments; the proximal edge is not straight. The apertura has two cardelles.

Genotype.—*Hippellozoon* (*Retepora*) *novezelandiae* Waters, 1894. Recent.

SCHIZELLOZOON, new genus.

(*Schizos*, slit).

The ovicell is widely open and provided with a semicircular slit. It has neither labial avicularium nor reteporidan pore. The operculum has a broad thickened border; the proximal edge is not straight. The poster of the apertura bears a wide little deep sinus.

Genotype.—*Schizellozoon* (*Retepora*) *imperati* Busk, 1884. Recent.

The spiramen (reteporidan pore of Waters) is replaced by a pseudospiramen which is a groove in the proximal lip of the peristomice.

TRIPHYLLOZOON, new genus.

(*Triphyllon*, trifoliate, alluding to the trifoliate ovicell.)

"The ovicell has a 'trifoliate stigma.' There is generally a minute avicularium on the lip to one side. The opercula generally are fairly similar with a nearly straight proximal edge, and in shape rather wider than long, with the muscular attachments rather high up and near the border. Apparently all have the labial pore which is often the end of a long tube opening into the zoœcium (=ascopore) proximally to the operculum" (Waters).

Genotype.—Triphyllozoon (*Retepora*) *moniliferum* MacGillivray, 1860. Recent.

Genus RHYNCHOZOON Hincks, 1891.

1881. *Rhynchopora* Hincks, British Marine Polyzoa, p. 385. (Preoccupied, replaced by Rhynchozoon in 1891.)

"This genus seems to be characterized by the possession of a more or less well-developed sinus on the apertura, by its ovicell which has an entire frontal surface, and is provided with an incomplete oœcial cover, and by the possession of pore-chambers (dietellæ.)" (Levinsen.)

Genotype.—Rhynchozoon (*Lepralia*) *bispinosa* Johnston, 1849. Recent.

Genus SCHIZOTHECA Hincks, 1877.

1877. *Schizotheca* Hincks, On British Polyzoa, pt. 2, Classification, Annals Magazine Natural History (4), vol. 20, p. 528; 1880, British Marine Polyzoa, p. 283.

"Zoœcia with a suborbicular primary orifice, the lower margin sinuated; the secondary orifice raised, tubular, notched in front. Ovicell terminal, with a fissure in the front wall, never closed by the operculum."

Genotype.—Schizotheca (*Lepralia*) *fissa* Busk, 1856. Recent.

Levinsen classified this genus in the Reteporidae, where we also believe it better placed.

Family GALEOPSIDAE Jullien, 1903.

The ovicell is hyperstomial and opens into the peristomie above the operculum. A spiramen introduces into the peristomie the water destined afterwards for the compensatrix.

In the family of the Adeonidae as in that of the Reteporidae this spiramen also exists; it is in evident relation with the hydrostatic system; it might have another use, another function unfortunately still unknown. It is not possible, for example, to compare the size of the spiramen of *Galeopsis* with the smallness of the orifice of the compensatrix simply closed by a rimule or by a poster of an operculum. On the other hand, it is quite frequent to find on the same zoarium some zoœcia deprived of spiramen, and which nevertheless are still living and contain a polypide.

Genus GALEOPSIS Jullien, 1903.

1903. *Galeopsis* Jullien, Bryozoa provenant des Campagnes de *l'Hirondelle*, p. 94.

The spiramen is very large and salient. The apertura has two cardelles. The frontal is a tremocyst or an olocyst.

Genotype.—*Galeopsis rabidus* Jullien, 1903.

Range.—Maestrichtian–Recent.

Several new species of this well-marked genus are known in the American Early Eocene.

SCHIZAROPSIS, new genus.

(*Schizos*, slit; *opsis*, appearance.)

The apertura bears a straight proximal border notched by a small rectilinear rimule. The frontal is garnished laterally with areolae; it is formed of a very finely granulated pleurocyst placed on a thick olocyst. The spiramen is almost as large as the peristomice.

Genotype.—*Schizaropsis convexa*, new species. Jacksonian.

SCHIZAROPSIS CONVEXA, new species.

Plate 5, fig. 7.

Description.—The zoarium incrusts oysters; the zoœcia are grouped in linear longitudinal lines. The zoœcia are distinct, a little elongated, elliptical, or rectangular; the frontal is very convex, smooth, or very finely granular, bordered laterally with six large widely spaced areolae. The apertura is formed of a semilunar anter and of a straight proximal border notched by a small rectilinear rimule. The spiramen is elliptical, transverse, placed on the exterior peristomie, almost as wide as the peristomice. The ovicell is globular, salient, smooth; it is hyperstomial and opens by a very large orifice above the apertura and opposite the spiramen. Two small triangular avicularia are placed symmetrically on each side of the apertura.

Measurements.—Apertura (without rimule) $\begin{cases} ha=0.05 \text{ mm.} \\ la=0.07 \text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=0.35\text{–}0.50 \text{ mm.} \\ lz=0.30 \text{ mm.} \end{cases}$

Variations.—The young zoœcia have no superior arch and are deprived of spiramen. On the adult zoœcia when the superior arch is not formed the lateral lips of the peristomie limit a rimule-spiramen. The lateral areolae are little visible because of the very large convexity of the frontal; they are quite apparent when the preparation is properly inclined.

The spiramen is little visible in perspective because it is in a plane almost perpendicular to the zoœcial plane.

Occurrence.—Lower Jacksonian: Jackson, Mississippi (rare).

Type.—Cat. No. 62603, U.S.N.M.

Genus HASWELLIA Busk, 1884.

1884. *Haswellia* Busk, Report on the Polyzoa collected by H. M. S. *Challenger*, pt. 1, p. 171.

The apertura has its proximal border notched by a very wide rimule not separated from the anter. The frontal is a very thick tremocyst. The spiramen is a small salient tube. The zoarium is cylindrical.

Genotype.—*Haswellia* (*Myriozoum*) *australiensis* Haswell, 1880.

Range.—Tongrian–Recent.

SEMIHASWELLIA, new genus.

The zoœcia are disposed only on one side of the zoarium; the dorsal bears only avicularia. The frontal and the dorsal are of the same nature and are formed of a tremocyst with sulci.

Genotype.—*Porina proboscidea* Waters, 1888. Range: Jacksonian–Recent.

This new genus is zoarial; no distinct zoœcial function separates it from *Haswellia*. Nevertheless it has some important zoarial functions susceptible of giving generic characters; the very constant presence of small dorsal avicularia seems to be a very good character. The recent specimens are extremely rare and it is still not possible to study them in detail. Species of both *Haswellia* and *Semihaswellia* occur in the Jacksonian of the Southern States.

Genus GIGANTOPORA Ridley, 1881.

1881. *Gigantopora* Ridley, Zoological collections made during survey of H. M. S. *Alert*. Proceedings Zoological Society London, p. 47.

The apertura bears a rimule. The frontal is an olocyst. The spiramen is inconstant; it is almost as large as the apertura.

Genotype.—*Gigantopora lynchoides* Ridley, 1881.

Range.—Jacksonian–Recent.

Genus GEPHYROPHORA Busk, 1884.

1884. *Gephyrophora* Busk, Report on the Polyzoa collected by H. M. S. *Challenger*, pt. 1, p. 67.

The apertura nears a proximal rimule. The frontal is a tremocyst.

Genotype.—*Gephyrophora polymorpha* Busk, 1884.

Range.—Tongrian–Recent.

Genus TESSARADOMA Norman, 1868.

1868. *Tessaradoma* NORMAN, Report 38th Meeting, British Association for the Advancement of Science, p. 309.

The apertura is provided with cardelles. The frontal is surrounded by areolae and covered by a pleurocyst. The spiramen opens at the level of the operculum. The operculum in opening closes the spiramen.

Genotype.—Tessaradoma (*Pustulopora*) *gracile* Sars, 1850.

Range.—Jacksonian–Recent.

In spite of Jullien's observations, the exact nature of the spiramen is still doubtful; its place and its function are not yet elucidated. Several species referred to this genus occur in the American Jacksonian.

TREMOTOICHOS, new genus.

(*Trema*, opening; *toichos*, wall.)

The frontal and the dorsal are tremocysts with sulci. The spiramen opens interiorly at the level of the operculum; exteriorly it is distant from the peristomice and almost never placed on the median axis of the zoœcia.

Genotype.—Tremotoichos rectifurcatum, new species. Jacksonian.

This genus possesses all the characters of *Semihaswellia;* the difference is little perceptible and consists solely in the place of the spiramen. As the latter does not appear to exercise the same physiological function (according to Jullien) as in *Semihaswellia*, we believe it necessary to create a new genus.

TREMOTOICHOS RECTIFURCATUM, new species.

Plate 6, fig. 1.

Description.—The zoarium is free, subcylindrical, branched almost at a right angle. The dorsal is very thick; deprived of avicularia and formed of a tremocyst with tubules and with sulci. The zoœcia are indistinct; the frontal is a tremocyst with sulci placed on an olocyst with very small perforations. The peristome is salient, perpendicular to the zoarial plane, thick, and provided with a small proximal avicularium; the peristomice is orbicular. The spiramen is a pore of the frontal placed on the right or left of the median axis and distant from the peristomice.

Measurements.—Peristomice $\begin{cases} hpe = 0.10 \text{ mm.} \\ lpe = 0.10 \text{ mm.} \end{cases}$

Zoœcia—$Lz = 0.70$ mm.

Variations.—The spiramen is not always apparent; it is confused with the tremopores. The peristome of the young zoœcia is thin.

The sulci are not always apparent on the dorsal. The peristome may bear two small avicularia. The branches are sometimes quite close together.

Occurrence.—Middle Jacksonian: Wilmington, North Carolina (very common), near Lenuds Ferry, South Carolina (very common). Upper Jacksonian (Ocala limestone): Chipola River, east of Marianna, Jackson County, Florida (rare).

Type.—Cat. No. 62606, U.S.N.M.

Family HIPPOPODINIDAE Levinsen, 1909.

The frontal is calcified. The ovicell is endozoœcial.

We have extended the meaning of Levinsen's definition since we include in this family all the species provided with an endozoœcial ovicell. Evidently we can not affirm that they all have the same larva; but the identity of the ovicell implies that the larvae are at least closely related.

The known genera of this family, all represented in American strata, are as follows:

Cheilopora Levinsen, 1909.
Hippopodina Levinsen, 1909.
Metrarabdotos Canu, 1914.
Watersipora Neviani, 1895.

Genus CHEILOPORA Levinsen, 1909.

1909. *Cheilopora* Levinsen, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 353.

The frontal is a tremocyst with pores in quincunx not separable from the olocyst subjacent and perforated with very small corresponding pores. Two dietellae. "The distal wall has no expansion partly separating the ovicell from the zoœcium; multiporous septulae; peristome present in the form of a liplike projection." (Levinsen, 1909.)

Genotype.—*Cheilopora* (*Lepralia*) *sincera* Smitt, 1867.

Range.—Aquia-Recent.

Cheilopora (*Lepralia*) *labiosa* Ulrich, 1901, and nine new species represent this genus in the early Tertiary of America.

Genus HIPPOPODINA Levinsen, 1909.

1909. *Hippopodina* Levinsen, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 353.

The apertura is provided with two cardelles. The frontal is a tremocyst placed on a finely perforated and very thin olocyst. The ovicell is endozoœcial. "The horizontal part of the distal wall is continued into an expansion which forms a partial partition between the ovicell and the zoœcium; uniporous septulae; no peristome." (Levinsen, 1909.)

Genotype.—*Hippopodina* (*Lepralia*) *feegensis* Busk, 1884.

Range.—Jacksonian–Recent.

HIPPOPODINA VIBRACULIFERA, new species.

Plate 5, fig. 8.

Description.—The zoarium is free, bilamellar; the two lamellae back to back are easily separated. The zoœcia are elongated, large, hexagonal; the frontal is convex and formed of a tremocyst with very numerous pores placed on a very finely perforated olocyst from which it is separable. The apertura is formed of a very large orbicular anter and of a narrower poster with proximal lip straight and denticulated; the vestibular arch is clearly visible. The endozoœcial ovicell is immense and takes the place of a zoœcium; it is convex and perforated with tremopores; the apertura of the ovarian zoœcia is much larger. Two auriculate vibracula are placed symmetrically on the distal part of the zoœcia.

Measurements.—Apertura of ordinary zoœcia $\begin{cases} ha=0.25\text{ mm.} \\ la=0.28\text{ mm.} \end{cases}$

Apertura of ovarian zoœcia $\begin{cases} ha=0.25\text{ mm.} \\ la=0.35\text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=0.90\text{–}1.10\text{ mm.} \\ lz=0.80\text{–}1.00\text{ mm.} \end{cases}$

Occurrence.—Middle Jacksonian: Wilmington, North Carolina (common).

Upper Jacksonian (Ocala limestone): Old factory, 1½ miles above Bainbridge, Georgia (rare).

Type.—Cat No. 62604, U.S.N.M.

Genus METRARABDOTOS Canu, 1914.

1914. *Metrarabdotos* CANU, Les Bryozoires fossiles Sud-Ouest France. Bulletin Societe Geologique France, ser. 3, vol. 14, p. 472.

The ovicell is endozoœcial. The apertura is semilunar, with a rimule and lyrule. The frontal is surrounded with lateral areolae and formed of an olocyst surmounted by a pleurocyst.

Genotype.—*Metrarabdotos* (*Eschara*) *moniliferum* Milne-Edwards, 1838.

Range.—Priabonian–Astian.

The genotype is a common and characteristic Vicksburgian fossil of the Southern States.

Genus WATERSIPORA Neviani, 1895.

895. *Watersipora* Neviani, Briozoi neozoici di alcune località d' Italia, Bolletino della Società Romana per gli Studi Zoologici, pt. 2, vol. 4, p. 231.

The operculum is membranous or very slightly chitinous on the borders; it exhibits a chitinous axial band of a brown color marking out from the rest of the operculum two lateral spaces which are clearer and which correspond to the two powerful cardelles borne by the zoœcial orifice. The frontal is a tremocyst.

Genotype.—*Watersipora* (*Lepralia*) *cucullata* (Busk, 1853), variety *labiosa* Calvet, 1903.

Range.—Helvetian–Recent. One new species in the Upper Jacksonian.

Family TUBUCELLARIIDAE Busk, 1884.

The zoœcia have no spines; their frontal is formed of long tremocystal tubules surmounting a thin perforated olocyst. The septulae are numerous, scattered, and multiporous. The ovicell is peristomiale, being formed by a great expansion of the peristomie which is always very long. The frontal bears an ascopore opening into the compensatrix.

The zoarium is free, unilamellar, bilamellar, or cylindrical. It is often articulated and radicellated. The articulated zoarium generally lives among algae, the mobility and flexibility of which it must share.

Key to genera.

Zoarium articulated. No avicularia .... *Tubucellaria.*
Zoarium, fixed, biamellar. Avicularia very rare .... *Tubucella.*
Zoarium unilamellar. Avicularia on each zoœcium .... *Tubiporella.*

Genus TUBUCELLARIA D'Orbigny, 1852.

1852. *Tubucellaria* D'Orbigny, Paleontologie francaise, Terrain Cretace, vol. 5, p. 335.

The zoarium is articulated and radicellated. The operculum is simple and separable. No vestibular arch, no avicularia.

Genotype.—*Tubucellaria* (*Cellaria*) *cereoides* Ellis and Solander, 1786.

Range.—Lutecian—Recent. Four new species in the Eocene and Oligocene of America.

TUBUCELLA, new genus or subgenus.

The zoarium is free, bilamellar, firmly attached, rigid. The avicularia are very rare. The peristomiale is equal to the frontal.

Genotype.—*Tubucella* (*Eschara*) *mamillaris* Milne-Edwards, 1836.

Range.—Lutecian–Jacksonian.

TUBUCELLA MONILIFERA, new species.

Plate 5, fig. 9.

Description.—The zoarium is free; the two lamellae are placed back to back and intimately joined; the fronds are broad, compressed, distorted, and branching. The zoœcia are much elongated, fusiform, little distinct, surrounded by a collar of large pores; the frontal and the peristomiale are of equal length, separated by the ascopore and perforated with small hexagonal pores. The peristome is salient, thick, oblique. The avicularia are very rare, large, transverse, elliptical, with two denticles for a pivot.

Measurements.—*Zoœcia* $\begin{cases} Lz = 0.90\text{–}1.00 \text{ mm.} \\ lz = 0.32 \text{ mm} \end{cases}$

Variations.—The zoœcia are very constant in their exterior aspect. The larger pores surround the peristomiale and are three times larger than the others.

Certain fronds bear some zoœcia, closed, not by the olocyst, but by the tremocyst, the tubules of which have encroached upon the peristome. The physiological function of these zoœcia is unknown.

The avicularia are scattered, are very large, and form a very large frontal, the origin of which is one of the lateral pores of the peristomiale.

Occurrence.—Middle Jacksonian: Wilmington, North Carolina (common).

Eutaw Springs, South Carolina (rare).

Type.—Cat. No. 62605, N.S.N.M.

Genus TUBIPORELLA Levinsen, 1909.

1909. *Tubiporella* LEVINSEN, Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 204.

A membranous opercular valve. A vestibular arch; each zoœcium with one or two avicularia at the height of the ascopore. The colony occurs as a free foliaceous expansion, with a single layer of zoœcia (Levinsen).

Genotype.—*Tubiporella* (*Lepralia*) *magnirostris* MacGillivray, 1882.

Range.—Miocene–Recent.

Family CATENICELLIDAE Busk, 1852.

CATENICELLA SUBSEPTENTRIONALIS, new species.

Plate 5, fig. 5.

The Catenicellidae are bryozoa peculiar to the southern hemisphere. They abound in the recent seas off Australia, and their fossil forms are frequent in the same region. However, Waters discovered in the Priabonian of the Vicentin[1] two species having some affinities with this family; namely *Catenicella septentrionalis* Waters 1891, and *C. continua* Waters, 1891. According to Waters[2] the latter species is a *Vittaticella* and the first belongs to a new genus.

The single and unique fragment found in America is very close to *Catenicella septentrionalis* Waters, 1891. It differs from it in its somewhat larger micrometric dimensions, more closely arranged frontal pores, and in the presence of a small, oral avicularium.

Occurrence.—Vicksburgian; Salt Mountain, 5 miles south of Jackson, Alabama. (Very rare.)

Type.—Cat. No. 62601, U.S.N.M.

Family ADEONIDAE Jullien, 1903.

The zoœcia are provided with a compensatrix, but are devoid of spines and oral glands. The areolae are always closed and excavated out of the wall substance itself. The frontal is composed of an olocyst covered by a very thick pleurocyst. The operculum opens at the bottom of a peristomie. The female zoœcia are of the kind termed gonœcia and are often larger than the others; they contain an ovicell sac in which the embryo is developed. The septulae are numerous, placed in linear rows, arranged to correspond to the areolae. The avicularia are frontal or interzoœcial; the latter have no pivot.

Genus MENISCOPORA Gregory, 1893.

1893. *Meniscopora* Gregory, British Palaeogene Bryozoa, Transactions Zoological Society of London, p. 250.

The zoœcia are trimorphic. The normal axial zoœcia have an external aperture straighter than that of the marginal zoœcia; the aperture is formed of a semilunar anterior and of a very concave posterior part. The gonœcia are larger than the ordinary zoœcia and their aperture is of different form. The peristomie is of slight depth. Interzoœcial avicularia are rare. Certain lateral areolae are transformed into small frontal avicularia.

Genotype.—Meniscopora bigibbera Gregory, 1892.

Range.—Thanetian–Helvetian.

Meniscopora (*Lepralia*) *subplana* Ulrich, 1901, from the Lower Eocene (Aquia) of Maryland and one new species from the Vicksburgian of Mississippi represent this genus in the United States.

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[1] North Italian Bryozoa, Quarterly Journal Geological Society London, vol. 47, 1891, p. 5, pl. 1, figs. 1–8.

[2] Marine Fauna Zanzibar, Proceedings Zoological Society London, 1913, p. 483.

Genus BRACEBRIDGIA MacGillivray, 1886.

1886. *Bracebridgia* MacGillivray, Description of new or little known Polyzoa, Transactions Royal Society Victoria, p. 8.

MacGillivray's original description is as follows:

Zoarium bilaminate, erect. Apertura subcircular, straighter below, with an internal denticle; peristome thickened, smooth, or with a small apiculate mucro; frequently in the fossils, but rarely in recent specimens, a triangular avicularium immediately below the lower lip; lateral avicularia on the free edges of the zoarium.

The gonœcia are larger than the usual zoœcia. The frontal is partially or totally covered by a pleurocyst which is more or less confluent with the subjacent olocyst.

Genotype.—*Bracebridgia* (*Porella*) *emendata* Waters, 1881.

Range.—Jacksonian–Recent.

One new species from the Middle Jacksonian of Georgia and a new variety of *Bracebridgia polymorpha* Reuss, 1864 occur in the Lower Tertiary of the United States.

Genus ADEONA (Lamouroux, 1816) Levinsen, 1909.

1909. Adeona Levinsen (Lamouroux, 1816), Morphological and Systematic Studies on the Cheilostomatous Bryozoa, p. 283.

The frontal is perforated by an ascopore opening into the compensatrix. The operculum is semilunar. The gonœcia are distinct and larger than the ordinary zoœcia.

Genotype.—*Adeona* (*Cellepora*) *heckeli* Reuss, 1847.

Genus ADEONELLA (Busk, 1884) Waters, 1888.

1884. *Adeonella* Busk, Report Voyage *Challenger*, Zoology, vol. 10, pt. 30, p. 183.

Zoarium erect, very variously branched or lobate, attached by a contracted base, or pedicle, often containing radical fibers and affixed usually on a more or less flexible support (Busk). The zoœcia without such median ascopores; the proximal part of the secondary aperture, which appears sooner or later, is transformed by a coalescence of two calcareous processes into a pore, which leads into the space between the primary and secondary aperture. (Levinsen, Waters.)

The peristomie is perforated by a spiramen. The aperture bears a concave lower lip which is the opening of the compensatrix; the operculum is at the bottom of the peristomie and below the spiramen.

Genotypes.—*Adeonella polymorpha* Busk, 1884, and *Adeonella* (*Eschara*) *polystomella* Reuss, 1847.

Range.—Jacksonian–Recent.

ADEONELLA FOLLICULATA, new species.

Plate 6, fig. 3.

Description.—The zoarium is bilamellar with two lamellae back to back and separable; the fronds are lobed, very thin and fragile. The zoœcia are very long, distinct, separated by a furrow, little convex, bordered with numerous parietal areolae (10–12 pairs). The peristomie is short, somewhat projecting exteriorly and is perforated by a spiramen; the peristomice is semilunar with a convex lower lip; the aperture (interior) presents a proximal concave border. The gonœcia are larger (0.30 mm.) than the other zoœcia; their external aperture is greater (la=0.10 mm.) and the spiramen is more removed from the aperture. There is a very small, simple avicularium on the peristomie.

Measurements.—Lateral zoœcia $\begin{cases} Lz=0.65\text{–}0.75 \text{ mm.} \\ lz=0.20\text{–}0.25 \text{ mm.} \end{cases}$

Axial zoœcia $\begin{cases} Lz=0.50 \text{ mm.} \\ lz=0.20 \text{ mm.} \end{cases}$

Gonœcia $\begin{cases} Lz=0.50 \text{ mm.} \\ lz=0.30 \text{ mm.} \end{cases}$

Peristomice of zoœcia $\begin{cases} hp=0.04 \text{ mm.} \\ lp=0.07 \text{ mm.} \end{cases}$

Peristomice of gonœcia $\begin{cases} hp=0.04 \text{ mm.} \\ lp=0.10 \text{ mm.} \end{cases}$

Occurrence.—Middle Jacksonian (Castle Hayne beds): Wilmington, North Carolina (common).

Type.—Cat. No. 62608, U.S.N.M.

Genus ADEONELLOPSIS MacGillivray, 1886.

1886. *Adeonellopis* MacGillivray, Description of New Polyzoa, pt. 9, Transactions Royal Society Victoria, p. 7.

The zoœcia provided in the central line with one or several ascopores. (Levinsen.)

The ascopores are grouped at the base of a cribriform area. Interzoœcial avicularia and gonœcia are present.

Genotype.—*Adeonellopsis foliacea* MacGillivray, 1886.

Range.—Wilcoxian–Recent.

Seven new species ranging from the Wilcoxian to the Vicksburgian have been determined in the Eocene of the United States.

PHYLACTELLIDAE, new family.

The ovicell is recumbent; its orifice is very large and closed by a special operculum. "The larvae are large and are more fully developed within the ovicell than is usual; the corona and cilia are very distinct."

In 1900 Waters[1] discovered the larva of *Phylactella.* It is quite distinct from all others in its form and its large dimensions, evidently characterizing a special family.

The special ovicell which Waters called recumbent is placed on the distal part of the zoœcium itself, between the apertura and the distal zoœcium. Viewed laterally it appears attached like a sack on the back of a porter. Evidently it is also more or less supported on the distal zoœcium, but frequenty it is completely separated from it. In its form, position, and large opening it is eminently adapted to the size of the larvae.

Genus PHYLACTELLA Hincks, 1880.

1880. *Phylactella* HINCKS, British Marine Polyzoa, p. 356.

The apertura is more or less circular; it bears either a lyrule or some cardelles. The thick band of the operculum is at a small distance from the edge. The apertura is surrounded by a peristomie more or less funnel shaped. The peristome is interrupted distally and replaced by a small tongue. The frontal is a tremocyst with very fine pores. No spines.

Genotype.—*Phylactella labrosa* Busk, 1852.

Range.—Jacksonian–Recent.

In addition to the one here described three new species have been determined in the Early Tertiary rocks of the Carolinas and Alabama.

PHYLACTELLA INFUNDIBULUM, new species.

Plate 6, fig. 2.

Description.—The zoarium incrusts other bryozoa. The zoœcia are large, distinct, elongated, oval; the frontal is quite convex; it is formed of a tremocyst with very small pores separated from each other by fine granules. The apertura is formed of a large semicircular anter, separated by two small cardelles from a very concave poster; the peristome is long, tubular, depressed in front, and interrupted behind by a wide distal tongue; the peristomie forms a sort of funnel around the apertura.. The ovicell is large, salient, globular, finely porous and granular; it is hyperstomial, recumbent, and opens into the peristomie.

Measurements.—Apertura $\left\{ \begin{array}{l} ha=0.16 \text{ mm.} \\ la=0.16\text{–}0.17 \text{ mm.} \end{array} \right.$

Zoœcia $\left\{ \begin{array}{l} Lz=1.25 \text{ mm.} \\ lz=0.72 \text{ mm.} \end{array} \right.$

This superb species is, unfortunately, quite rare.

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[1] 1900. Waters, Bryozoa from Franz Josef Land. Journal Linnean Society Zoology, London, vol. 28, p. 90, pl. 12 figs. 3, 4.

Occurrence.—Middle Jacksonian (Castle Hayne limestone): Wilmington, North Carolina (rare).

Type.—Cat. No. 62607, U.S.N.M.

PERIGASTRELLA, new genus.

(*Peri*, around; *gaster*, stomach.)

The apertura is semicircular. The thick band of the operculum is on the border. The frontal is surrounded by one or two rows of small areolae; it is formed of an olocyst supporting a smooth or finely granular pleurocyst. Spines.

Genotype.—*Perigastrella* (*Lepralia*) *labiata* Bœck, 1861.

Range.—Lutecian—Recent.

This genus is abundantly represented in the Claibornian, Jacksonian, and Vicksburgian of the Southern States, *Perigastrella* (*Cellepora*) *cycloris* Gabb and Horn, 1862, and 13 new species being known.

PERIGASTRELLA OVOIDEA, new species.

Plate 6, fig. 8.

Description.—The zoarium incrusts shells. The zoœcia are distinct, elongated, large, ovoid; the frontal is very convex, bordered by three small areolar pores, and formed of a very finely granular pleurocyst, almost smooth. The apertura, almost invisible exteriorly, is trapezoidal and oblique; the peristomie is deep; the peristome is very oblique and bears 6–8 spines; it is sometimes interrupted in front, but more often it bears a salient mucro, oblique or erect, hiding more or less the apertura; there is small lyrule in the apertura. The ovicell is small, salient, globular, almost entirely detached from the distal zoœcium; it is hyperstomial and recumbent; its frontal is finely granular, like the zoœcia. The ancestrula is very small, but identical in form with the other zoœcia.

Measurements.—Apertura $\begin{cases} ha=0.05 \text{ mm.} \\ la=0.06\text{–}0.10 \text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=0.75\text{–}0.80 \text{ mm.} \\ lz=0.50 \text{ mm.} \end{cases}$

Affinities.—This beautiful species is quite recognizable by its very large zoœcial convexity. It differs from *Perigastrella semierecta* Koschinsky, 1885, in the presence of spines and in its somewhat larger dimensions.

Occurrence.—Middle Jacksonian: Eutaw Springs, South Carolina (common).

Upper Jacksonian: Railroad wharf at Bainbridge, Georgia (common).

Type.—Cat. No. 62613, U.S.N.M.

Genus HEMICYCLOPORA Norman, 1909.

1909. *Hemicyclopora* NORMAN, Polyzoa of Madeira and neighboring islands. Journal Linnean Society, London, Zoology, vol. 30, p. 308.

The ovicell is recumbent. The apertura is provided with very low cardelles and formed of a large anter and of a small concave poster. The frontal is smooth and formed of an olocyst. Spines.

Genotype.—*Hemicyclopora* (*Lepralia*) *polita* Hincks, 1880.

Range.—Helvetian–Recent.

HEMICYCLOPORA PARAJUNCTA, new species.

Plate 6, fig. 6.

Description.—The zoarium incrusts shells. The zoœcia are distinct, somewhat elongated, ogival; the frontal is somewhat convex and absolutely smooth. The apertura is oblique, suborbicular; the peristome bears 8 distal spines and a proximal small mucronoid lip. The ovicell is globular, very salient, smooth, very little joined to the distal zoœcium; it is recumbent, hyperstomial.

Measurements.—Apertura $\begin{cases} ha=0.10\text{ mm.} \\ la=0.09\text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz=0.50\text{–}0.55\text{ mm.} \\ lz=0.40\text{–}0.55\text{ mm.} \end{cases}$

Affinities.—This species offers the exterior aspect of a *Perigastrella* with very small areolae, which generally appear smooth.

Occurrence.—Middle Jacksonian: Near Lenuds Ferry, South Carolina (common).

Type.—Cat. No. 62610, U.S.N.M.

Genus MASTIGOPHORA Hincks, 1880.

1880. *Mastigophora* HINCKS, British Marine Polyzoa, p. 278.

The ovicell is small and recumbent. The apertura is semilunar; its proximal border is straight and bears a rimule elongated and rounded. The frontal is a tremocyst with small pores placed on an olocyst. Vibracula.

Genotypes.—*Mastigophora hyndmanni* Johnson, 1847, and *Mastigophora* (*Flustra*) *dutertrei* Savigny-Audouin, 1826.

Range.—Lutecian–Recent.

Both of the genotypes of this well-marked genus occur in the Jacksonian and Vicksburgian strata of the Southern States.

SCHIZOBATHYSELLA, new genus.

(*Schizos*, slit, and *bathys*, deep, referring to the position of the apertura.)

The apertura presents on its straight proximal border a small linear rimule. The ovicell is recumbent and opens widely above the apertura. The frontal is a tremocyst. The peristomie is greatly expanded and is interrupted in front by an immense incomplete spiramen. The avicularium is vibraculoid.

Genotype.—Schizobathysella saccifera, new species. Jacksonian.

This genus differs from *Mastigophora* only in the nature of the peristome, which is much more salient and interrupted in front by a pseudospiramen.

It differs from *Gigantopora* Ridley, provided also with a spiramen, in the different form of the operculum and in its smooth frontal.

SCHIZOBATHYSELLA SACCIFERA, new species.

Plate 6, fig. 7.

Description.—The zoarium incrusts shells. The zoœcia are distinct, elongated, irregularly elliptical; the frontal is convex and formed of a tremocyst with small pores. The apertura is semilunar; it bears on its straight proximal border a small linear rimule; the peristome is much developed into two large lateral lips circumscribing a sort of incomplete and very large spiramen. The ovicell is hyperstomial and recumbent; it forms a sort of small, punctured sack placed on the bottom of the zoœcium. A small vibraculoid avicularium is developed laterally near the apertura.

Measurements.—Apertura {*ha*=0.08 mm.
la=0.10 mm.
Zoœcia *Lz*=0.60–0.70 mm.
lz=0.30–0.40 mm.

Variations.—The peristome is quite variable. The tremopores are often obliterated by fossilization. The ovicell is truly recumbent or partially supported on the distal zoœcium. To accommodate so great a peristomial complexity it is probable that the tentacles were very long and fine.

Occurrence.—Middle Jacksonian (Castle Hayne limestone): Wilmington, North Carolina (rare).

Type.—Cat. No. 62611, U.S.N.M.

Genus LAGENIPORA Hincks, 1877.

1877. *Lagenipora* Hincks, British Polyzoa, Annals Magazine Natural History (4), vol. 20, p. 215.

Colonies consisting of a number of cells immersed in a common calcareous crust. Zoœcia recumbent, contiguous, lageniform; oral extremity free, tubular, with a terminal orbicular orifice. (Hincks.)

Genotype.—Lagenipora socialis Hincks, 1880.

Range.—Jacksonian–Recent.

Family CELLEPORIDAE Busk, 1852.

The ovicell is recumbent. The budding is double; terminal and superficial. The zooecia are more or less erect and cumulate.

Genus SCHISMOPORA MacGillivray, 1888.

1888. *Schismopora* MacGillivray, Bryozoa in McCoy's Prodromus of the Zoology of Victoria, vol. 2, dec. 17, p. 253.

The ovicell is perforated. The frontal is smooth. The apertura bears a proximal rimule. No spines.

Genotypes.—Schismopora (*Cellepora*) *coronopus* S. Wood, 1850, and *Schismopora* (*Cellepora*) *pumicosa* Busk, 1854.

Range.—Jacksonian–Recent.

Three new species of *Schismopora* occur in the Jacksonian of the Southern States.

Genus OSTHIMOSIA Jullien, 1888.

1888. *Osthimosia* Jullien, Mission scientifique du Cap Horn, No. 6, Zoologie, p. 64.

The ovicell is not perforated. The frontal is surrounded by areolae. The apertura bears a proximal rimule. There are no spines.

Selected genotype.—Osthimosia (*Cellepora*) *eationensis* Busk, 1884.

Range.—Jacksonian–Recent.

Jullien's genotype was *Osthimosia evexa* Jullien, 1888.

Osthimosia (*Reptocelleporina*) *glomerata* Gabb and Horn, 1862, from the Jacksonian and Vicksburgian, is the only American representative of this genus known.

Genus COSTAZZIA Neviani, 1895.

1895. *Costazzia* Neviani, Briozoi neozoici di alcune localita d'Italia, Bolletino Societa Romana per gli Studi Zoologici, pt. 2, vol. 4, p. 235 (sep. 11).

The ovicell at the side of the peristome has a flat area and pores around the border. (Waters.)

I zoeci, acervulati, hanno la frontal molto rigonfia, variamente perforata ed ornata da leggere costule; l'apertura zoeciale subtrigona con labbro calloso; grandi aviculari scafoidi sono sparsi fra i zoeci. (Neviani.)

Genotype.—Costazzia (*Cellepora*) *costazzi* Savigny-Audouin, 1828.

Range.—Vicksburgian–Recent.

Genus HOLOPORELLA Waters, 1909.

1909. *Holoporella* Waters, Reports on the Marine Biology of the Sudanese Red Sea, etc., pt. 12. The Bryozoa. Journal Linnean Society, London, vol. 31, p. 159.

The lower lip of the aperture is more or less straight; the operculum has the muscles attached near the border, sometimes with a ridge (for the attachment of the tentacular sheath) running inwards. The ovicell is a widely open cap. There are usually oral and vicarious (interzoœcial) avicularia, and the mandible of one of the two usually has a small projection from the base or columella. (Waters, 1909.) Spines.

Genotype.—Holoporella (*Cellepora*) *descostilsi* Savigny-Audouin, 1828.

Range.—Claibornian–Recent.

The genus *Holoporella* is represented in the Claibornian, Jacksonian, and Vicksburgian of the Southern States by 12 new species.

ACANTHIONELLA, new genus.

(*Akanthos*, spine.)

The apertura is oval and bears a long lyrule. The frontal is a very thick olocyst, in which are lodged some avicularia. The ovicell is hyperstomial. It is lodged in the thickening of the frontal of the distal zoœcia. It opens into the peristomie.

Genotype.—Acanthionella (*Escharifora*) *typica* Gabb and Horn, 1862.

Range.—Maastrichtian–Claibornian.

This genus differs from *Kleidionella* in the presence of a lyrule and the rarity of cumulate zoœcia.

KLEIDIONELLA, new genus.

(*Kleidion*, small key, referring to the form of the apertura.)

The apertura is oval. The frontal is a very thick olocyst. The ovicell is hyperstomial and lodged in the olocyst of the distal zoœcia. It opens into the peristomie. There are some small and some large interzoœcial avicularia. No lyrule.

Genotype.—Kleidionella grandis, new species.

Range.—Claibornian–Vicksburgian.

The abundance of cumulate zoœcia and the absence of lyrule distinguishes this genus from the preceding one, *Acanthionella*.

KLEIDIONELLA GRANDIS, new species.

Plate 6, figs. 9, 10.

Description.—The zoarium is very large, compressed, formed of bifurcated fronds almost in the same plane, attaining toward the base 2 cm. 5 mm. in width. The zoœcia are disposed in two groups, back to back and inseparable. The axial zoœcia back to back are oriented; all the other zoœcia are cumulate. The superficial zoœcia are distinct, urceolate, little raised, very oblique; the frontal is quite convex, smooth, bearing 0–3 improminent avicularia with pivot; the frontal is formed of a very thick olocyst. The apertura is oval, deeply imbedded at the base of a peristomie; the peristomice is irregular, suborbicular. The deep zoœcia have a flat frontal; their avicularia are prominent between the superficial zoœcia. The interzoœcial avicularia are distinct, elliptical, of the size of zoœcia; they have a pivot; their orifice is like the beak of a duck; the passage of the reflexor muscles of the operculum is indicated by the very small perforations on the inferior cavity; the beak is salient above the zoarium. The incomplete zoœcia are quite numerous. On many zoaria there are some distinct groups of large zoœcia and of small zoœcia.

Measurements.—Apertura (interior) $\begin{cases} ha = 0.15 \text{ mm.} \\ la = 0.15 \text{ mm.} \end{cases}$

Zoœcia $\begin{cases} Lz = 0.60 \text{ mm.} \\ lz = 0.30\text{–}0.35 \text{ mm.} \end{cases}$

Variations.—Following the rule, the variations of these Cellepores are quite great, but the species is always rather easy to determine by its zoarial size.

Occurrence.—Lower Jacksonian: Jackson, Mississippi (common).

Middle Jacksonian: Wilmington, North Carolina (common); 3½ miles south of Perry, Georgia (common).

Upper Jacksonian: Cocoa post office, Choctaw County, Alabama (very common).

Vicksburgian: 7½ miles from Bladen Springs, Alabama (rare); Red Bluff, Wayne County, Mississippi (rare).

Type.—Cat. No. 62613, U.S.N.M.

Family CONESCHARELLINIDAE Levinsen, 1909.

The zoœcia are erect; the apertura is terminal. The gemmation is always and uniquely lateral. The ovicell is hyperstomial and recumbent. There is a zoœcial and a zoarial hydrostatic system.

This is a very mysterious group which has given the zoologists much trouble. Only Maplestone in 1910[1] has given some details on the zoarial life.

Almost all our specimens belong to a new American genus *Schizorthosecos.*

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[1] 1910. Maplestone. On the Growth and Habits of Biporae, Proceedings Royal Society Victoria, vol. 23.

Genus FEDORA Jullien, 1882.

1882. *Fedora* JULLIEN, Dragages du *Travailleur*, Bulletin Société Zoologique France, vol. 7, p. 17.

According to Jullien this genus has the following characters: Zoœcia subhexagonal with circular orifice, thick but not salient, notched on its posterior fourth where it is thin; finally placed a little above the center of the zoœcium, of which it occupies about a third of the diameter; the ovicell nonsalient, indicated exteriorly by a smooth stripe forming an obtuse angle, of which the summit is turned toward the orifice. Avicularia not constant, situated on the sides and outside of the orifice.

Genotype.—*Fedora edwardsi* Jullien, 1882.

Range.—Lutecian-Recent. One American species.

Genus STICHOPORINA Stoliczka, 1862.

1862. *Stichoporina* STOLICZKA, Oligocäne Bryozoen von Latdorf in Bernburg. Sitzungsberichte der k. Akademie der Wissenschaften, Wien. vol. 45, Abth. 1, pp. 71–74, pls. 1–3.

The zoarium is cupuliform. The apertura is orbicular or elliptical with two cardelles; the apertura of the ovarian zoœcia is larger and transverse. The avicularia have some vibraculoid mandibles.

Genotype.—*Stichoporina simplex* Koschincki, 1885.

Range.—Lutecian-Recent.

The only American species of *Stichoporina* differs in no appreciable manner from the well-known *S. protecta* Koschinski of the Lutecian and Priabonian. In North America the species has been found only in the Middle Jacksonian of North Carolina.

SCHIZORTHOSECOS, new genus.

(*Schizos*, slit; *orthos*, straight; secos, small habitation.)

The zoarium is cupuliform. The apertura is oval with a proximal rounded rimule. There are numerous interzoœcial zoœciules capable of being transformed into avicularia, into radicular zoœciules, and into compensation zoœciules.

Genotype.—*Schizorthosecos* (*Orbitolites*) *interstitia* Lea, 1833.

Range.—Clabornian, Jacksonian.

This genus is exclusively American; it characterizes the Claibornian and the base of the Jacksonian where it is exterminated unexpectedly.

It differs from *Conescharellina* D'Orbigny and *Bipora* Whitelegge, 1887, in its distinct zoœcia and in the absence of lunœcia. Moreover, we have not yet discovered the ovicells on the hundreds of specimens which we have at our disposal.

SCHIZORTHOSECOS INTERSTITIA Lea, 1833.

Plate 6, figs. 4, 5.

1833. *Orbitolites interstitia* Lea, Contribution to Geology, Philadelphia, p. 191, pl. 6, fig. 204.

1862. *Lunulites interstitia* Gabb and Horn, Monograph fossil Polyzoa Secondary and Tertiary formations North America, Journal Academy Natural Science, Philadelphia (2), vol. 5, p. 120.

1890. *Lunulites* (*Cupularia*) *interstitia* De Gregoria, Monographie Fauna Eocenique de Alabama, Annal. de Geologie et du Paleontologie, pts. 7, 8, p. 249, pl. 42, figs. 16–22.

Description.—The zoarium is cupuliform, little deep. The zoœcia are distinct, tubular, erect, terminated by a narrowed peristomie. The apertura is placed at the base of the peristomie; in its rimule, it often has a flat lyrule; the peristomice is of the same form as the apertura. Between the peristomes, on the external surface, there are numerous zoœciules which are transformed according to their position into radicular zoœciules, into avicularia with pivot, or into compensation zoœciules. On the inner face each zoœcium is indicated by a hexagon perforated with 6 to 10 large tremopores, which are the orifices of long tubules; some large avicularia with pivot surround the ancestrula.

Occurrence.—Claibornian: Claiborne, Alabama (very common), and many other localities.

Lower Jacksonian: Jackson, Mississippi (very common).

Type.—Cat. No. 62609, U.S.N.M.

Genus ORBITULIPORA Stoliczka, 1862.

1862. *Orbitulipora* Stoliczka, Oligocane Bryozoen von Latdorf in Bernburg, Sitzungsberichte der k. Akademie der Wissenschaften, Wien, vol. 45, Abth., p. 90.

The apertura is orbicular. The frontal is a tremocyst. The zoarium is orbicular and formed of two lamellae with zoœcia back to back.

Genotype—Orbitulipora (*Cellepora*) *petiolus* Lonsdale, 1850.

Range.—Auversian–Tortonian.

Genus BATOPORA Reuss, 1847.

1847. *Batopora* Reuss, Die fossilien Polyparien des Wiener Tertiarbeckens, Haidinger's naturwissenschaftliche, Abth. vol. 2, Wien, p. 78.

The apertura is orbicular. The frontal is a granular olocyst. The zoarium is conical, never hollow. The ancestrular zoœcium is ornamented with radicular pores.

Genotype.—*Batopora rosula* Reuss, 1847.

Range.—Lutecian–Tortonian.

Genus DIPLOTAXIS Reuss, 1867.

1867. *Diplotaxis* Reuss, Ueber einige Bryozoen aus dem deutschen Unteroligocan, Sitzungsberichte der k. Acad. der Wissenschaften, Wien, Abth. 1 p. 16.

The zoarium is discoidal and formed of two lamellae back to back. The zoœcia of the external face are oriented toward the zoarial margins; the zoœcia of the inner face are oriented toward the center. The apertura has a distal rimule.

Genotype.—Diplotaxis placentula Reuss, 1867. Latdorfian.

Genus CONESCHARELLINA D'Orbigny, 1851.

1851. *Conescharellina* D'Orbigny, Paleontologie francaise. Terrain Cretace, vol. 5, p. 446.

The zoarium with lunœcia. The zoaria which have the form of a low cone or an arched disk only show a single layer of zoœcia, while their inner cavity is occupied by numerous avicularia placed in horizontal layers. Ovicells may occur. (After Levinsen, 1909.) The apertura has a distal rimule.

Genotype.—Conescharellina cancellata Busk, 1852.

Range.—Miocene–Recent.

The lunœcia are the openings of special compensation zoœciules.

Genus BIPORA Whitelegge, 1887.

1887. *Bipora* Whitelegge, Notes on some Australian Polyzoa, Proceedings Linnean Society, New South Wales (2), vol. 2, p. 337.

The zoarium with lunœcia. The zoaria are plate-like or fan-shaped with two layers of zoœcia; ovicells are not found. (After Levinsen, 1909.) The apertura has a proximal rimule.

Genotype.—Bipora umbonata Haswell, 1880. Recent.

Genus FLABELLIPORA D'Orbigny, 1851.

1851. *Flabellipora* D'Orbigny, Paleontologie française. Terrain Crétacé, vol. 5, p. 432.

The zoaria, which have no lunœcia, are plate-like, two-layered; no ovicells. (After Levinsen, 1909.) The apertura has a proximal rimule.

Genotype.—Flabellipora elegans D'Orbigny, 1851. Recent.

Genus MAMILLOPORA Smitt, 1872.

1872. *Mamillopora* Smitt, Floridian Bryozoa, pt. 1, Kongl. Svenska Vetenskaps Akademiens Handlingar, vol. 10, No. 11, p. 33.

The zoaria, which have no lunœcia, are plate-like, two-layered; no submedian cardelles. There are some avicularia between the zooecia. The ovicelled zoœcia are much larger; their apertura is not transverse.

Genotype.—Mamillopora cupula Smitt, 1872. Recent. (Florida.)

EXPLANATION OF PLATES.

PLATE 1.

Membraniporina benjamini, new species (page 11).

FIG. 1. Surface of the incrusting zoarium × 20, showing the elliptical zoœcia and the incomplete small canal.
Upper Jacksonian, Rich Hill, Crawford County, Georgia.
Cat. No. 62569, U. S. N. M.

Adenifera inarmata, new species (page 12).

2. The usual aspect of the zoœcia, × 20.
Middle Jacksonian near Lenuds Ferry, South Carolina.
Cat. No. 62570, U. S. N. M.

Otionella perforata, new species (page 13).

3. Portion of the upper surface of an incomplete discoidal zoarium, × 20.
4. The inner side of a fragment, × 20.
Claibornian, Claiborne, Alabama.
Cat. No. 62571, U. S. N. M.

Vibracellina capillaria, new species (page 14).

5. The type-specimen, × 20.
Claibornian, Moseley's Ferry, Caldwell County, Texas.
Cat. No. 62572, U. S. N. M.

Hincksina jacksonica, new species (page 15).

6. Surface of the bilamellar zoarium, × 20; with interzoœcial avicularia little developed.
Middle Jacksonian, Rich Hill, Crawford County, Georgia.
Cat. No. 62573, U. S. N. M.

Hincksina megavicularia, new species (page 16).

7. Portion of a zoarium, × 20, illustrating especially the coalescing of opposite spines and the occurrence of large avicularia.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62574, U. S. N. M.

PLATE 2.

Ogivalina eximipora, new species (page 17).

FIG. 1. Portion of a zoarim, × 20, showing several ovicelled zoœcia.
Middle Jacksonian, Rich Hill, Crawford County, Georgia.
Cat. No. 62575, U. S. N. M.

Membrendoecium pyriforme, new species (page 17).

2. Surface of a specimen. × 20, exhibiting the characteristic pyriform opesium.
Lower Jacksonian, Jackson, Mississippi.
Cat. No. 62576, U. S. N. M.

Periporosella tantilla, new species (page 19).

3. Exterior of a zoarium, with ovicells, × 20.
4. An example with the surface abraded to show the dietellae, × 20.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62577, U. S. N. M.

Membraniporidra porrecta, new species (page 21).

FIG. 5. Portion of a zoarium with ovicelled zoœcia, × 20.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62578, U. S. N. M.

Grammella transversa, new species (page 20).

6. View of zoarial surface, × 20, illustrating the zoœcial characters and the transverse avicularia.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62579, U. S. N. M.

Ellisina laxa, new species (page 19).

7. Photograph of the incrusting zoarium, × 20, showing the thin mural rim, the avicularium, and the dietellae.
Middle Jacksonian. Wilmington, North Carolina.
Cat. No. 62580, U. S. N. M.

PLATE 3.

Stamenocella mediaviculifera, new species (page 22).

FIG. 1. Surface of the bilamellar zoarium, × 20, exhibiting the elongate zoœcia, broken ovicells, and median avicularia.
Middle Jacksonian, 3¼ miles southwest of Perry, Georgia.
Cat. No. 62581, U. S. N. M.

Diplopholeos fusiforme, new species (page 26).

2. Photograph of the incrusting zoarium, × 20, showing the dimorphic opesia, the symmetrical lateral indentations, and the straight onychocellaria.
Upper Jacksonian, 4 miles below Bainbridge, Georgia.
Cat. No. 62582, U. S. N. M.

Floridinella vicksburgica, new species (page 28).

3. Two fragments natural size, and the surface, × 20, of this hollow stemmed species.
Vicksburgian, 1 mile north of Monroeville, Alabama.
Cat. No. 62583, U. S. N. M.

Dacryonella octonaria, new species (page 28).

4. Well preserved surface of the incrusting zoarium, × 20, exhibiting the improminent polypidian convexity, the large lateral indentations, and the numerous small avicularia.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62584, U. S. N. M.

Aechmella filimargo, new species (page 29).

5. View of the incrusting zoarium, × 20, with the characteristic avicularia.
Upper Jacksonian, west bank of Sepulga River, Escambia County, Alabama.
Cat. No. 62585, U. S. N. M.

Metracolposa robusta, new species (page 35).

6. Portion of surface of the bilamellar zoarium, × 20, with ovicelled zoœcia.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62586, U. S. N. M.

PLATE 4.

Acanthocella erinacea, new species (page 36).

FIG. 1. Usual aspect of the zoœcia, × 20, with an ovicell developed on one.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62587, U. S. N. M.

Cribrendoecium tenuicostulatum, new species (page 36).

2. Surface, × 20, showing the very fine costules, transverse ovicells, and large interzoœcial avicularia.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62588, U. S. N. M.

Gastropella ventricosa, new species (page 38).

3. Portion of the free cylindrical zoarium, × 20, displaying the smooth frontal, lateral areolæ and the very large ascopore.
Midwayan, Mabelvale, near Little Rock, Arkansas.
Cat. No. 62589, U. S. N. M.

Metroperiella biplanata, new species (page 41).

4. Surface of the bilamellar zoarium, × 20. The median avicularium is usually broken.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62590, U. S. N. M.

Hippozeugosella teges, new species (page 42).

5. A fragmentary zoarium, × 20.
Upper Jacksonian, Chipola River, east of Marianna, Florida.
Cat. No. 62591, U. S. N. M.

Didymosella crassa, new species (page 43).

6. Celluliferous surface of the unilamellar zoarium, × 20, with the two large conspicuous pores to each zoœcium.
Vicksburgian, west bank of Conecuh River, Escambia County, Alabama.
Cat. No. 62592, U. S. N. M.

Stomachetosella crassicollis, new species (page 45).

7. Surface of the bilamellar zoarium, × 20, showing ovicelled zoœcia.
Vicksburgian, west bank of Conecuh River, Escambia County, Alabama.
Cat. No. 62593, U. S. N. M.

Enoplostomella defixa, new species (page 46).

8. Portion of the cylindrical zoarium, × 20.
Vicksburgian, 1 mile north of Monroeville, Alabama.
Cat. No. 62594, U. S. N. M.

Schizemiella claibornica, new species (page 47).

9. View of surface of the bilamellar zoarium, × 20, illustrating the indistinct zoœcia and apertura with wide rimule.
Clairbornian, Clairborne, Alabama.
Cat. No. 62595, U. S. N. M.

Metradolium dissimilis, new species (page 48).

10. Part of the bilamellar zoarium, × 20, with both ovicelled and nonovicelled zoœcia.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62596, U. S. N. M.

PLATE 5.

Leiosella rostrifera, new species (page 48).

FIG. 1. Portion of the narrow bilamellar zoarium, × 20, showing the smooth frontal of the zoœcia.
Vicksburgian, 1 mile north of Monroeville, Alabama.
Cat. No. 62597, U. S. N. M.

Metrocrypta bucculenta, new species (page 49).

2. A branched fragment, × 20.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62598, U. S. N. M.

Ochetosella jacksonica, new species (page 50).

3. View of well-preserved cylindrical zoarium, × 20.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62599, U. S. N. M.

Plagiosmittia regularis, new species (page 51).

4. Surface of the bilamellar zoarium, × 20. All of the zoœcia are ovicelled.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62600, U. S. N. M.

Cateniccella subseptentrionalis, new species (page 63).

5. The only fragment discovered, × 20.
Vicksburgian, Salt Mountain, 5 miles south of Jackson, Alabama.
Cat. No. 62601, U. S. N. M.

Cystisella midwayanica, new species (page 53).

6. View of the incrusting zoarium, × 20.
Midwayan, Luverne, Crenshaw County, Alabama.
Cat. No. 62602, U. S. N. M.

Schizaropsis convexa, new species (page 57).

7. Both ovicelled and nonovicelled zoœcia of the incrusting zoarium, × 20, exhibiting the large spiramen.
Lower Jacksonian, Jackson, Mississippi.
Cat. No. 62603, U. S. N. M.

Hippopodina vibraculifera, new species (page 61).

8. Surface of the bilamellar zoarium, × 20, with two ovicelled zoœcia.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62604, U. S. N. M.

Tubucella monilifera, new species (page 63).

9. View of the bilamellar zoarium, × 20, with one zoœcium closed.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62605, U. S. N. M.

PLATE 6.

Tremotoichos rectifurcatum, new species (page 59).

FIG. 1. Frontal side of a well-preserved fragment, × 20.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62606, U. S. N. M.

Phylactella infundibulum, new species (page 67).

2. Several zoœcia, × 20, including an ovicelled one.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62607, U. S. N. M.

Adeonella folliculata, new species (page 66).

FIG. 3. Fragment of the bilamellar zoarium, natural size, and the surface, × 20.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62608, U. S. N. M.

Schizorthosecos interstitia Lea, 1833 (page 75).

4. A zoarium, × 6.
5. Upper surface of a zoarium, × 20.
Claibornian, Claiborne, Alabama.
Cat. No. 62609, U. S. N. M.

Hemicyclopora parajuncta, new species (page 69).

6. Portion of the incrusting zoarium, × 20.
Middle Jacksonian, near Lenuds Ferry, South Carolina.
Cat. No. 62610, U. S. N. M.

Schizobathysella saccifera, new species (page 70).

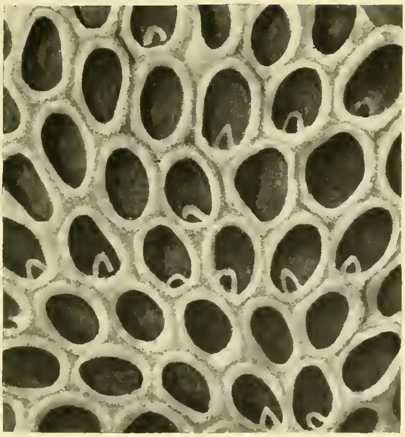
7. The incrusting zoarium, × 20, exhibiting both ovicelled and nonovicelled zoœcia.
Middle Jacksonian, Wilmington, North Carolina.
Cat. No. 62611, U. S. N. M.

Perigastrella ovoidea, new species (page 68).

8. View of the incrusting zoarium with quite convex zoœcia, × 20.
Upper Jacksonian, Bainbridge, Georgia.
Cat. No. 62613, U. S. N. M.

Kleidionella grandis, new species (page 72).

9. Portion of a small zoarium, natural size.
10. Surface of a zoarium, × 20.
Upper Jacksonian, Cocoa Post Office, Choctow County, Alabama.
Cat. No. 62613, U. S. N. M.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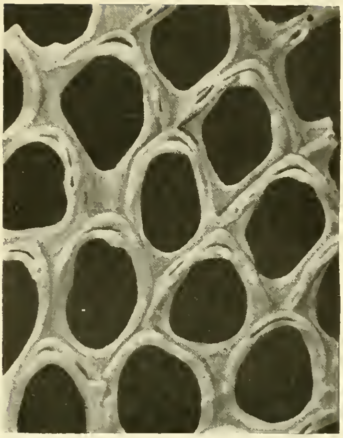
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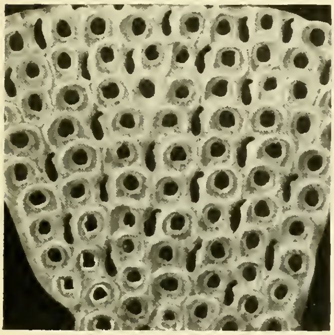
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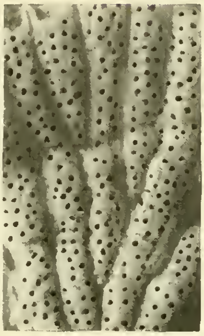
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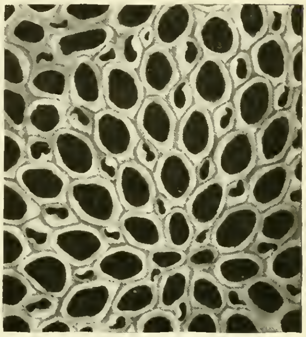
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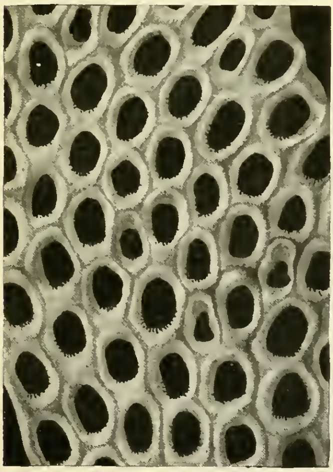
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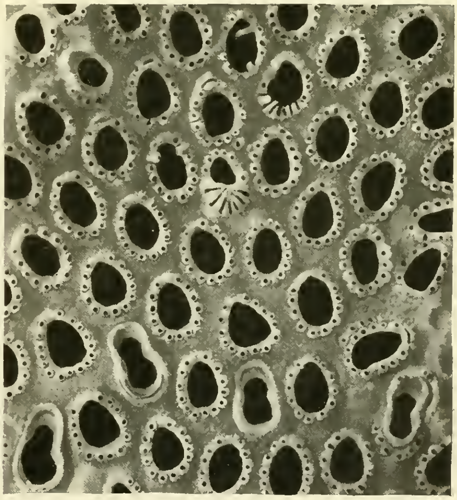
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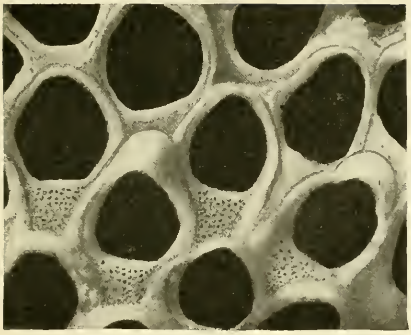
AMERICAN TERTIARY CHEILOSTOME BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 77.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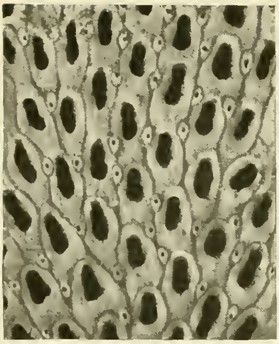
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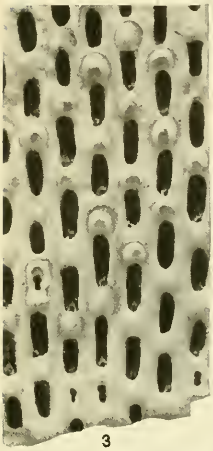
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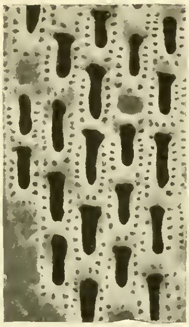
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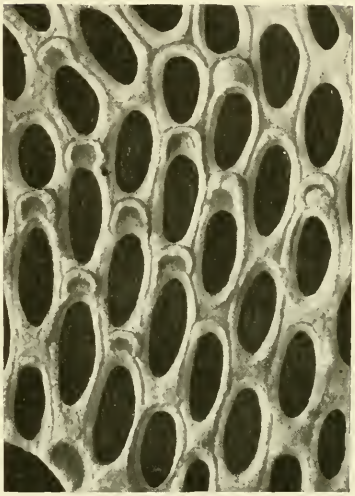
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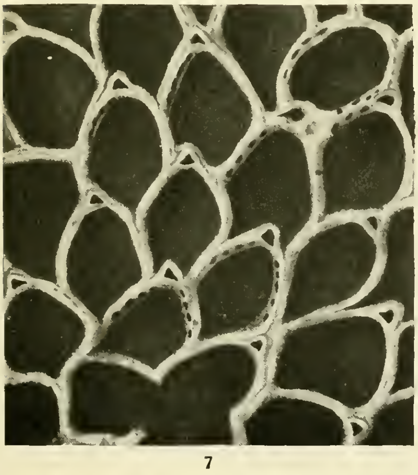
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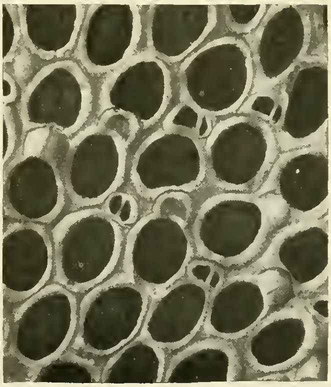
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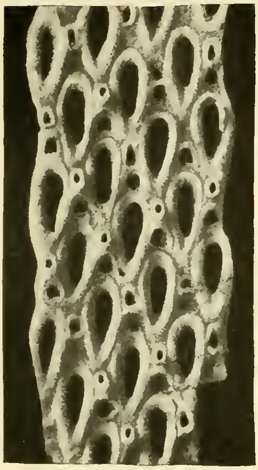

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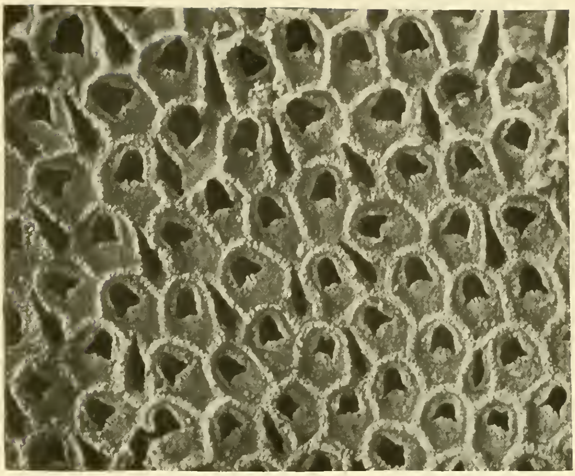

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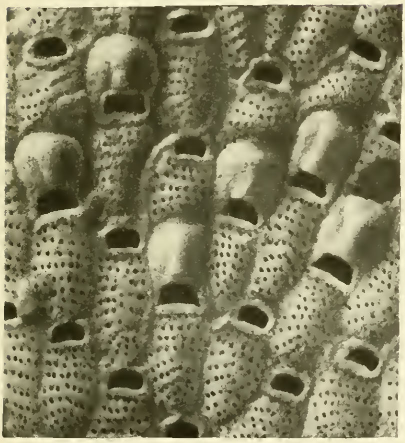

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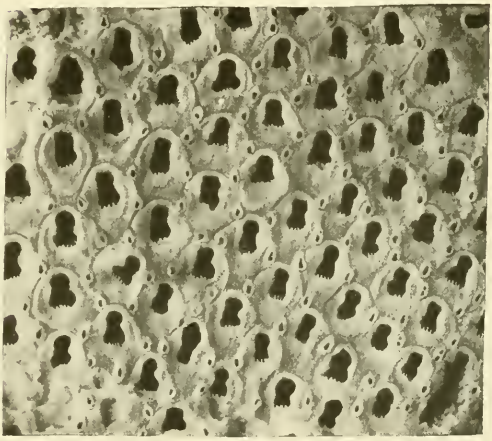

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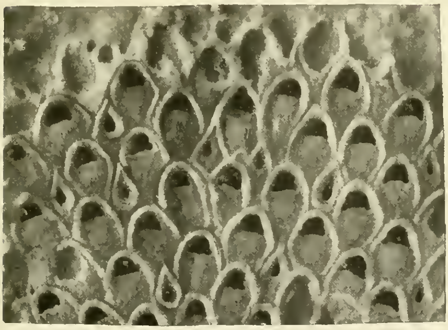

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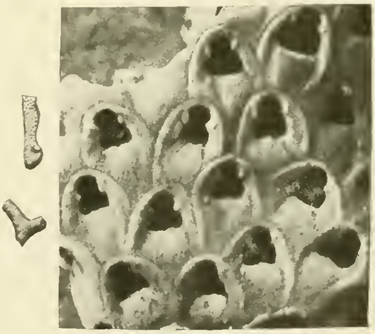

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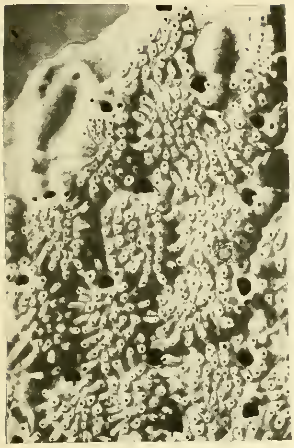

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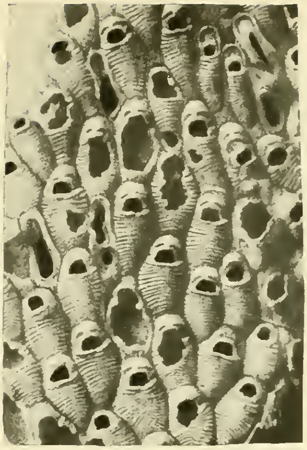

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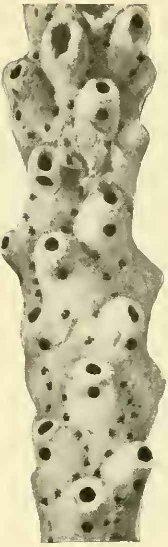

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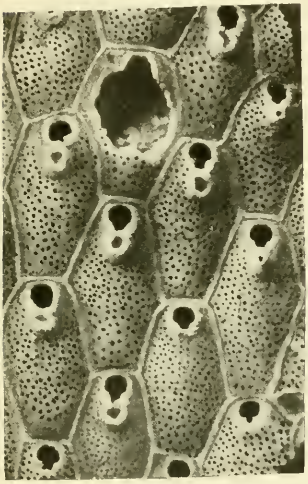

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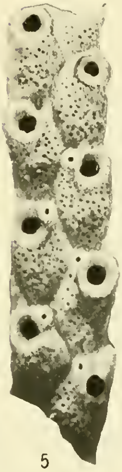

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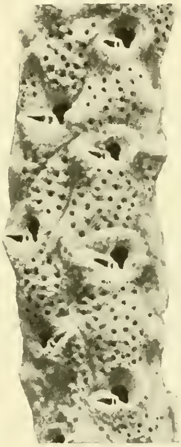

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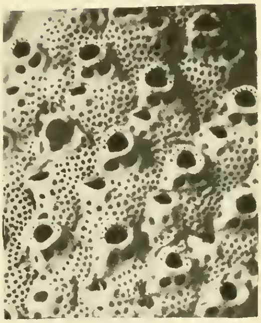

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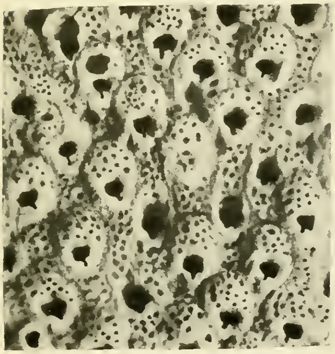

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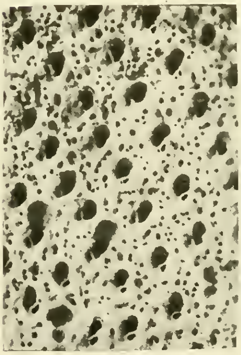

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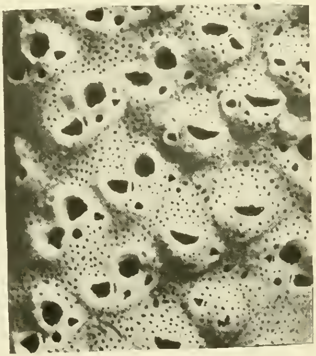

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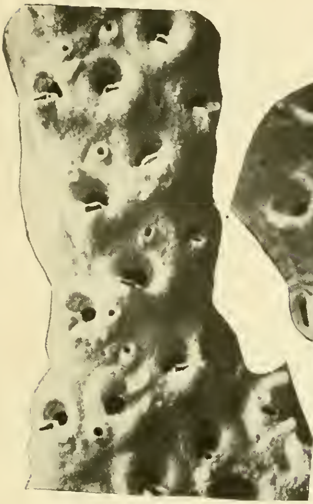

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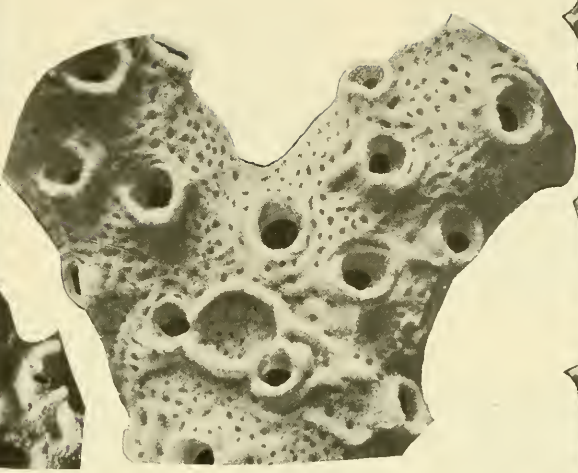

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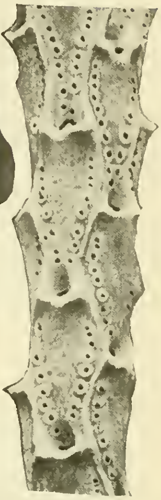

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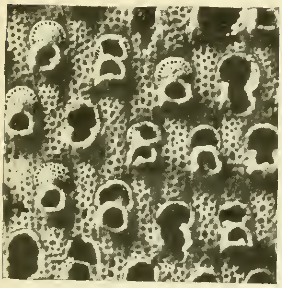

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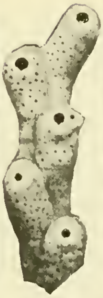

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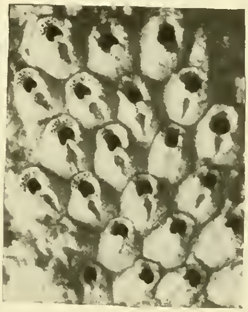

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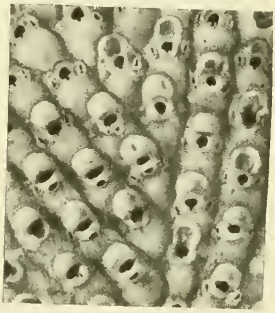

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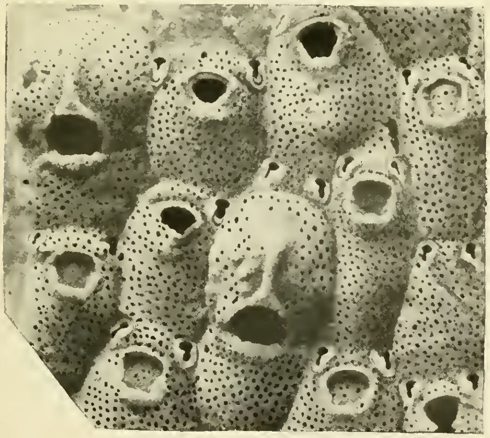

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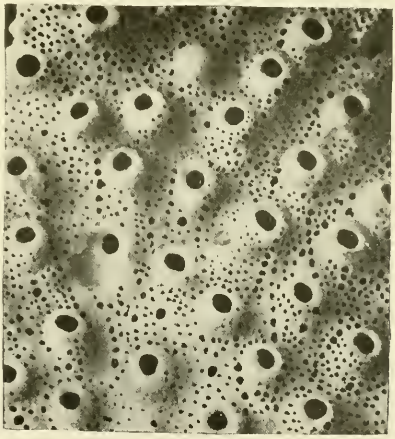

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AMERICAN TERTIARY CHEILOSTOME BRYOZOA.

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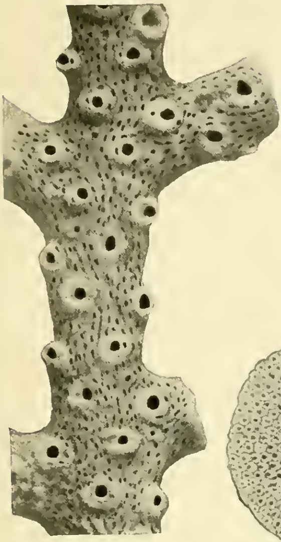

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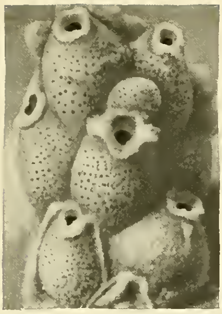

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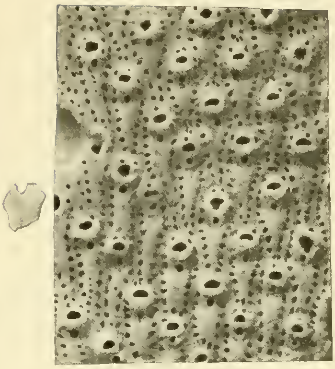

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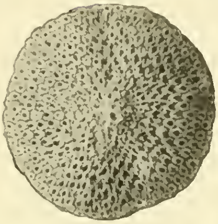

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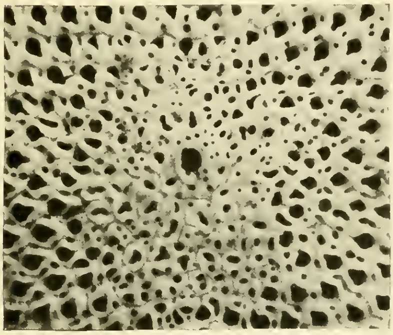

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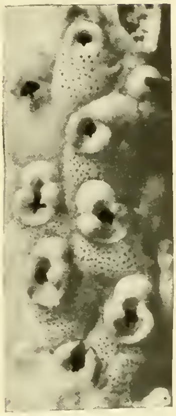

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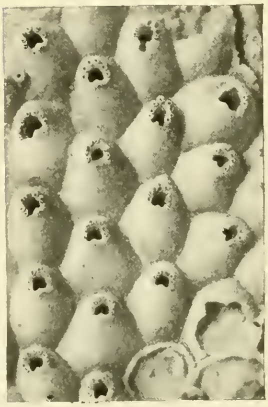

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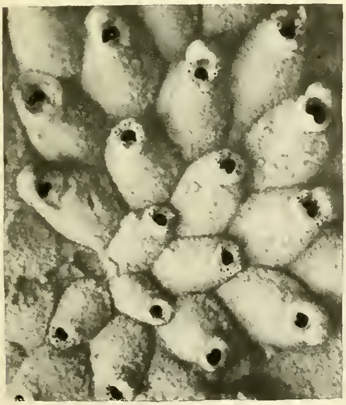

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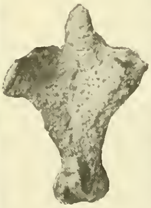

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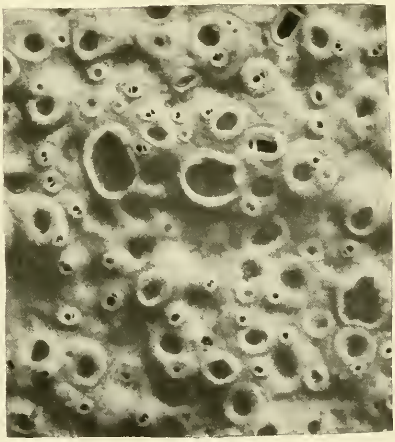

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